The Effects of Focus and Diversification on Bank Risk and Return: Evidence from Individual Bank Loan Portfolios[1]

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Abstract

We study empirically the effect of focus (specialization) vs. diversification on the return and the risk of banks using data from 105 Italian banks over the period 1993–1999. Specifically, we analyze the tradeoffs between (loan portfolio) focus and diversification using a unique data set that is able to identify *individual* bank loan exposures to different industries, to different sectors, and to different geographical regions. Our results are consistent with a theory that predicts a deterioration in bank monitoring quality at high levels of risk and a deterioration in bank monitoring quality upon lending expansion into newer or competitive industries. We find that industrial loan diversification reduces bank return while endogenously producing riskier loans for all banks in our sample, this effect being most powerful for high risk banks. Sectoral loan diversification only produces an inefficient risk–return tradeoff for banks with very high levels of risk. Geographical diversification on the other hand does result in an improvement in the risk–return tradeoff for banks with low levels of risk. Overall, our results suggest that diversification of bank assets is not guaranteed to produce more performance efficient and/or safer banks.

1 Introduction

The issue of choosing between focus and diversification of a firm's business activities has been at the center of a large body of literature in corporate finance. Of particular interest has been the question of whether diversification enhances or destroys the profitability of firms and, in turn, their value. The broad evidence seems to suggest that diversification does destroy value leading to what is popularly knows as the "diversification discount."[1] Several theories have been proposed to explain this phenomenon such as managerial risk-aversion (Baruch and Lev, 1981), agency problems between managers and shareholders (Denis, Denis and Sarin, 1997, and Cornett et al., 2001), inefficiency of internal capital markets (Scharfstein and Stein, 2000), and power-struggles between different segments of a firm (Rajan, Servaes and Zingales, 2000). Some of these studies have also attempted to link their theories to the cross-sectional variation in diversification discounts and premia.

Surprisingly however, this issue has not been addressed thoroughly in the context of an important class of firms: financial institutions (FIs) and banks.[2] There are several reasons why this class is attractive for an investigation of the focus vs. diversification issue. It appears at first blush that FIs and banks can achieve either focus or diversification a lot more easily than ordinary firms by investing or disinvesting financial claims (loans) in certain industries and markets. In contrast, a standard corporation has a somewhat limited choice in expanding its product range and the transaction costs of adjusting its portfolio of real–sector activities may well be very high. In addition, financial institutions face several (often conflicting) regulations that create incentives either to diversify or focus their assets, such as the imposition of capital requirements that are tied to the risk of assets, branching and asset investment restrictions, etc. Hence, from both an economic as well as a policy standpoint, it is interesting to ask if FIs and banks benefit from diversification. In particular, when does their risk–return tradeoff improve upon diversification of their loan portfolio to more industries and countries?

Finally, the very nature of an intermediary's business activity makes the question of focus

[1] Diversification discount is measured as the difference between the value of a merged or a diversified firm and the sum of the values of stand-alone firms corresponding to the acquired firms or the merged business segments. Lang and Stulz (1994) show that diversified firms in U.S. have poorer firm performance (Tobin's q) compared to pure–play firms. Comment and Jarrell (1995), and, Berger and Ofek (1995) document that diversification discount in the U.S. is in the range of 12.7% to 15.2%. Lins and Servaes (1999) provide evidence for Germany, Japan, and U.K. The issue of there being a discount on average is still under debate. For example, Campa and Kedia (2000) and Villalonga (2001) model econometrically the endogenous choice of firms to be focused or diversified and document that average discount is much lower than previously estimated. It is difficult however to dispute the claim that there is significant cross–sectional variation in discounts and premia across different firms.

[2] DeLong (2001) does look at this issue in the context of merger of financial firms in the U.S.

versus diversification an interesting issue to explore. FIs and banks act as "delegated monitors" in the sense of Diamond (1984). The very act of performing this delegated monitoring function renders them "special" on the lending side in that they have (at least some form of) information monopoly over the firms they lend to, as noted by Fama (1980, 1985), and James (1987), and as modelled by Rajan (1992) and Sharpe (1990). The downside risk of borrowing firms translates into the riskiness of the loans held by FIs and banks. The quality of banks' and FIs' delegated monitoring thus directly affects the *endogenous* quality of their loans and in turn their default risk. However, due to the equityholder–creditor conflicts discussed in Jensen and Meckling (1976) and Myers (1977) among others, incentives to monitor are affected by the extent of debt in the FI's capital structure and the downside risk of the firms to whom it lends.[3] Under such an incentive structure, can FIs and banks monitor their loans effectively as they expand into new industries and segments of the loan markets? How does the decision to be focused or diversified affect their monitoring incentives and the endogenous quality, i.e., the risk and the return, of their loans?

In this paper, we attempt to answer some of these questions empirically by examining data on the asset and loan portfolio composition of individual Italian banks during the period 1993–1999. The choice of Italian banks is driven by the availability of detailed industrial, sectoral, and geographical composition of their balance-sheets. By contrast, in the United States, publicly available data on bank loan portfolios is restricted to call reports which do not contain such "fine" asset decompositions. The U.S. regulators do not provide the breakdown of individual (or aggregate) bank lending to specific industries. Instead, the general level of disaggregation is highly "macro" in nature, e.g., household sector loans, commercial and industrial loans, etc. We obtain results that are sufficiently strong and robust to warrant a closer look at the wisdom of simply advocating banks to diversify as much as possible, and, suggest a more careful assessment needs to be made of the costs and benefits of diversification.

Some of these issues have been looked at in a recent paper by Winton (1999). Winton presents a theoretical framework to investigate the merit to FIs and banks of the proverbial wisdom of not putting all your eggs in one basket.[4] Winton's model provides a number of testable empirical hypotheses which we use to frame the empirical tests below. These

[3]For illustration, consider the extreme case where debt hangover is extremely high so that all benefit from monitoring will accrue only to creditors. In this case, bankowners (equityholders or managers assumed to be fully aligned with equityholders) have little "incentive to monitor." In general, the underinvestment in monitoring will be more severe the greater the debt hangover problem.

[4]Winton motivates the issue by comparing the following two advices: *"Its the part of a wise man to keep himself today for tomorrow and not venture all his eggs in one basket"* by Miguel de Cervantes (Don Quixote de la Mancha, 1605), and, *Behold the fool saith "Put not thine eggs in one basket" - which is but a manner of saying, "Scatter your money and attention"; but the wise man saith "Put all your eggs in one basket and watch that basket"* by Mark Twain (Pudd'nhead Wilson, 1894).

hypotheses are central to the focus versus diversification debate. Specifically, we examine two principal hypotheses:

H.1 The relationship between bank return and diversification is non–linear in bank risk (inverted U–shaped). To be precise, diversification across loan sectors helps a bank's return most when loans have moderate exposure to sector downturns (downside risk); when loans have low downside risk, diversification has little benefit; when loans have sufficiently high downside risk, diversification may actually reduce its return.[5]

INSERT FIGURE 1 HERE.

From traditional portfolio theory, we know that diversification increases the central tendency of the distribution of loan portfolio. However, as Winton (1999) notes, when debt is risky and high enough compared to this central tendency, diversification can in fact increase the probability of default. For sake of illustration, Figure 1 plots the cumulative probability function for two normal distributions with different standard deviations and with a common mean of zero. If the level of debt is to the left of zero (under a suitable scale), e.g., at x $= -1$, then a decrease in standard deviation reduces the probability of default. However, if the level of debt is to the right of zero, e.g., at x $= 1$, then a decrease in standard deviation actually increases the probability of default. The left skewed nature of a typical loan portfolio's return distribution implies that the level of debt, in fact, may not need to be too high for this perverse effect to arise.[6]

H.2 A bank's monitoring effectiveness may be lower in newly entered and competitive sectors, and thus, diversification can result in a poorer quality of loans and increase the bank's risk of failure.

There are three reasons why this might arise. First, banks may lack the monitoring expertise in lending to a new sector when there are learning costs. Second, when the loan

[5]By portfolio "downside risk," we mean the likelihood that the portfolio return will be lower than a given threshold (e.g., level of deposits in the bank's capital structure), an event that constitutes a "default." An alternative measure of downside risk, and one that is employed in the paper due to its greater measurability, is the expected losses on the loans that constitute the portfolio.

[6]The additional bite to this hypothesis arises from the interaction of this perverse effect of diversification on bank risk and the bank's monitoring incentives. The conflict of interest between bankowners and bank creditors implies that an increase in the probability of default accentuates the debt hangover problem and reduces the incentives of bankowners to monitor their loans. If the loan portfolio has higher downside risk, then an improvement in loan monitoring and, in turn, in loan quality, produces greater benefit to the creditors than to the bankowners. Since the cost of monitoring is borne by the bankowners, the residual claimants, their incentives to monitor loans are reduced.

sector to which banks migrate to is already being supplied to by other banks, the effect of competition could subject banks to adverse selection and a "winner's curse" effect.[7] This suggests that diversification could lower returns on bank loans and increase its risk of failure to a greater degree when the sectors into which the bank expands have greater competition from its peers.[8] Third, diversification can cause a bank to grow in size, subjecting it to the agency–based scale inefficiencies discussed in the corporate finance literature.[9]

Broadly speaking, a bank's credit risk depends on its monitoring incentives and effectiveness as well as on diversification. Thus, diversification *per se* is no guarantee of a reduced risk of failure. By the same token, regulatory requirements to diversify are no assurance of greater banking system stability.[10]

Overall, our results provide strong support for these two hypotheses. We measure focus using the Herfindahl index for a bank's (i) non-financial and housing loan portfolio (I–HHI), (ii) overall asset sector portfolio (A–HHI), and (iii) geographical portfolio (G–HHI).[11] Thus, an increase in HHI measures (focus), in what follows, implies a decrease in diversification. We reject the hypothesis that increased diversification (reduced focus) improves bank returns, measured either as return on assets, return on equity, stock return (wherever the bank is publicly traded), and market–adjusted or beta–adjusted stock return. Further, we find that this relationship between focus and bank return is non–linear in the risk of the bank and is in fact U–shaped as implied by hypothesis H.1 above. Specifically, industrial diversification appears to decrease return for all levels of bank risk, the decrease being the least for moderate risk levels and the greatest for high risk levels. Asset sectoral and geographic diversification on the other hand increase return at moderate levels of risk, but reduce return at very high levels of risk. We proxy for bank risk in these estimations using a bank's doubtful and non–performing loans to assets ratio.

Next, we test hypothesis H.2 by examining endogenous loan quality (risk) by treating risk as a dependent variable that is affected by the extent of focus (diversification). Our empirical results suggest that increased focus in terms of industrial sector or asset sectoral exposure (high values for I–HHI and A–HHI) improves loan quality (reduces risk), whereas

[7]Several papers discuss this effect of bank competition on loan quality. Some representative references are Dell'Arricia, Friedman, and Marquez (1999) and Gehrig (1998) for theory, and Shaffer (1998) for empirics.

[8]The optimal response of banks to competition may thus be to focus (see, also, Boot and Thakor, 2000).

[9]See Denis, Denis and Sarin (1997), Scharfstein and Stein (2000), Rajan, Servaes and Zingales (2000), and, Maksimovic and Phillips (2002).

[10]For example, in the U.S., regulations restrict a bank's lending to any one counterparty to a maximum of 15% of that bank's capital.

[11]The Herfindahl index is the sum of the squared weights corresponding to a bank's exposure to different industries, sectors, or geographical areas. A higher value of the index corresponds to greater focus or lower diversification.

geographical focus (G–HHI) affects loan quality adversely. Further, we find evidence that when banks enter as lenders into "newer" industries (as measured by a decrease in industrial focus, i.e., a time-series reduction in I–HHI), there is a contemporaneous deterioration in loan quality (increase in risk).[12] This deterioration is greater, the greater the competition for loans that the entering bank faces in the "new" industry. The results thus underscore the importance of "watching the basket" of loans and the need for banks to specialize in particular sectors for greater effectiveness in monitoring and risk control.[13]

Combining these results on bank returns and bank loan quality (risk), we conclude that increased industrial loan diversification results in an inefficient risk–return tradeoff for the (Italian) banks in our sample, and sectoral diversification results in an inefficient risk–return tradeoff for banks with relatively high levels of risk. Geographical diversification on the other hand does result in an improvement in the risk–return tradeoff for banks with low or moderate current levels of risk.

These results have important and direct implications for the optimal size and scope of a "bank". While traditional banking theory based on a delegated monitor argument recommends that it is optimal for a bank to be maximally diversified across sectors (see, for example, Boyd and Prescott, 1986), our results suggest that there seem to be diseconomies of scope that arise through weak monitoring incentives and a poorer quality of loan portfolio when a risky bank expands into additional industries and sectors. This complements the agency theory based analysis of the boundaries of a bank's activities or its scope as proposed in Cerasi and Daltung (2000).[14] It also suggests that the optimal industrial organization of a banking sector might be one with several focused banks, an outcome that may also be attractive from an aggregate risk or a systemic risk standpoint as noted by Acharya (2001) and Shafffer (1994).

From a normative standpoint, our results sound a cautionary note to the adoption of regulatory mechanisms that encourage bank–level diversification or attempt to measure credit portfolio risk through traditional diversification measures, without due regard for the endogenously determined quality of loans. Our results could also help explain the empirically documented phenomenon of DeLong (2001) who finds that bank mergers which are activity *and* geography focusing produce superior economic performance than those that diversify.

[12]We use the qualifier "newer" for industries in the sense that previous exposures of the bank to these industries had been lower or non–existent, rather than being newer in the sense of technological changes produced by the industries.

[13]We conduct several robustness checks including a simultaneous equations estimation of the return and risk effects resulting from focus (diversification).

[14]We believe that the agency theories based on conflicts across firm segments proposed in corporate finance to explain the poor performance of conglomerates cannot completely explain the perverse effect of diversification on bank returns and bank loan risk. A bank's lending to different industries is much more centralized than is the operation of a typical conglomerate's different segments.

Finally, our paper is the first to employ a measure of industrial and sectoral focus or diversification for bank loan portfolios.[15] It is also the first to point out a potentially important and undocumented economic difference between bank diversification achieved through industrial or asset sectoral exposures and diversification achieved through geographical expansions.

Section 2 describes our data. Section 3 formalizes the empirical hypotheses, H.1 and H.2, and presents the results. Section 4 provides a discussion and concludes.

2 Data

2.1 Data sources

Data for the industrial, asset, and geographic decompositions of the portfolios of Italian banks in our study are taken from the regulatory reports submitted by these banks to the Central Bank of Italy, Banker's Association of Italy (ABI), and Fondo Interbancario di Tutela dei Deposita (FITS). The latter is the Italian equivalent of the U.S. Federal Deposit Insurance Corporation (FDIC). Our sample starts with a base of 105 commercial banks that reported their asset portfolio and other data during the entire 1993–1999 period. These 105 banks constitute over 80 percent of the total banking assets of Italy.[16] In terms of size, 8 of these banks are "very large" (as defined by the Central Bank of Italy), 7 are "large," 15 are "medium," and the remaining 75 are "small." In terms of geographical scope of banking activities, 8 of these banks are "national," 18 are "regional," 14 are "intra–regional," 10 are "local," and the remaining 55 are "provincial."

For each bank, data is available to calculate the following portfolio decompositions:

1. A disaggregated industrial sector decomposition based on each bank's top five industrial sector exposures with a sixth exposure comprising of the sum of the remaining exposures, where the exposures could be to any of the 23 industries among: (1) Agricultural, Forestry, and Fishing products, (2) Energy products, (3) Iron and non–iron Material and Ore, (4) Ores and products based on non-metallic minerals, (5) Chemicals,

[15] In the banking literature, Saunders and Wilson (2001), Hughes, Lang, Mester and Moon (1996), and Berger and DeYoung (2001) examine geographical diversification. Caprio and Wilson (1997) examine cross–country evidence for relationship between on–balance sheet concentration and bank insolvency. Klein and Saidenberg (1998) present portfolio simulations demonstrating that multi–bank bank holding companies hold less capital and do more lending, on average, than their pro forma "pure–play" benchmarks. Berger, Demsetz and Strahan (1999) find that consolidation in financial services industry has been consistent with greater diversification of risks on average but with little or no cost efficiency improvements.

[16] A few of the banks in our sample undertook acquisitions of other banks. Our data set however does not provide any details as to which were these acquiring banks and which banks did they acquire.

(6) Metal products, apart from machinery and means of conveyance, (7) Agricultural and Industrial machinery, (8) Office, EDP Machinery, and others, (9) Electric material, (10) Transport, (11) Food products, Beverages, and Tobacco-based products, (12) Textile, Leather, Shoes, and Clothing products, (13) Paper, Publishing, and Printing products, (14) Rubber and Plastic products, (15) Other Industrial products, (16) Construction, (17) Services trade and similar, (18) Hotel and Public firms products, (19) Internal Transport services, (20) Sea and Air Transports, (21) Transport related services, (22) Communication services, and (23) Other Sales related services. Note that in aggregate these exposures (collectively defined in the data as Non–financial and Household exposures) constitute the dominant part of each bank's portfolio.

2. A broad asset sectoral decomposition based on exposures to (1) Sovereigns, (2) Other governmental authorities, (3) Non–financial corporations, (4) Financial institutions, (5) Households, and (6) Other counterparties.

3. A geographical decomposition of all credits (other than those to Financial Institutions) based on exposures to (1) Italy, (2) Other countries of the European Union (EU), and (3) Other countries (rest of the world).

These details on portfolio allocation and loan distribution in different industries and geographic region are from ABI and from the FITS. Note that the size of bank lending to a particular sector, industry, or geographical region in our data set is net of loans that are already classified as either doubtful or non–performing.

The Financial Statement variables and capital structure details are obtained from the Central Bank of Italy and Bankscope data bases. Stock market data items for the 34 banks that are publicly traded were taken from the Datastream and Milan Stock exchange information bases on Italian Banks. A few banks had to be discarded from the sample due to missing values of relevant variables, e.g., doubtful and non–performing loans.

2.2 Construction of Herfindahl indices

We measure focus (diversification) by employing a Hirschman Herfindahl Index (HHI) measure. HHI is the sum of the squares of exposures as a fraction of total exposure under a given classification. In our case, we construct three different kinds of HHI's, which consist of Industrial and Household sector HHI, simply referred to as Industrial sector HHI (I–HHI), Broad Asset sector HHI (A–HHI), and Geographic HHI (G–HHI).

I–HHI is based on the 5 top industries where loans were made for each bank. The 6th exposure considers the rest of the loans in these sectors. For the 6th exposure, we employed

two conventions: first, where the 6th exposure is treated as a separate "hypothetical" industry, and second, where the 6th exposure is treated as being equally divided among the remaining 18 industries. Our results were not sensitive to this choice. Hence, we report results with I–HHI computed using the 6th exposure as a hypothetical industry. Thus, if the proportional exposures to six industries are X_1, X_2, X_3, X_4, X_5, and X_6, respectively, then I–HHI equals $\sum_{i=1}^{6}(X_i/Q)^2$, where $Q = \sum_{i=1}^{6} X_i$. Note that the HHI has a maximum of 1 when all loans are made to a single industry.

A–HHI is the sum of the squared exposures (measured as a fraction) in the form of sovereign loans, other governmental loans, non-financial sector loans, financial sector loans, household sector loans, and other loans.

G–HHI is the sum of the squared exposures (measured as a fraction) to Domestic (Italian) loans, European Union loans, and Rest of the World loans.

2.3 Balance-sheet and Stock market variables

We employ the following (annual) variables obtained from the balance–sheet and stock market data for the banks in our sample over the period 1993–1999.

Return measures:

1. ROA: return on assets measured as Net Income / Assets.
2. ROE: return on equity measured as Net Income / Equity.
3. SR: stock return measured as the return over the current year, i.e., as the return from end of previous year to the last day of the current year.
4. BSR: market or beta–adjusted stock return measured as the residual from a one–factor market model which employs MIB General, a weighted arithmetic average of all stocks listed on the Milan Stock Exchange (Borsa Valori di Milano) as the market and where the beta is computed for each year using the daily return series over the previous year.

Risk measure: DOUBT, the doubtful and non–performing assets ratio measured as Doubtful and Non–performing Loans / Assets.

Control variables:

1. SIZE: asset size of the bank (in million).

2. EQRATIO: capital ratio of the bank measured as Equity (Book–Value) / Assets, the equivalent of the bank's Tier 1 capital ratio.

3. BRRATIO: branch ratio measured as Number of Bank Branches / Assets.

4. EMPRATIO: employee ratio measured as Number of Employees / Assets.

INSERT TABLES 1 AND 2 HERE

Table 1 presents the univariate statistics (mean, median, standard deviation, minimum, and maximum) for these variables and for Herfindahl indices for all the banks over the sample period of 1993–1999. Table 2 completes the descriptive statistics by presenting the correlation matrix across these variables. As the tables illustrate, the three measures of focus, I–HHI, A–HHI, and G–HHI, are not highly correlated suggesting the possibility that their effects on bank efficiency may be different. Further, there is significant variation in all the variables we employ and the correlations suggest a relationship between return measures (ROA, ROE, and SR) and the balance-sheet control variables (SIZE, BRRATIO, EMPRATIO).

3 Effect of Focus on Bank Performance

To study the overall effect of a bank's focus (diversification), we study its effect on both bank return and bank risk. If focus produces an increase in bank return and a decrease in bank risk, then we interpret this result as focus improving bank performance, and thus, by implication that increased diversification would decrease bank performance. On the other hand, if focus results in a decrease in bank return and an increase in bank risk, then we conclude that focus reduces bank performance, i.e., increased diversification would improve bank performance. When bank return and bank risk either both increase or both decrease, the overall effect on bank performance is ambiguous and cannot be determined without taking a stand on what constitutes an "efficient" risk–return tradeoff. We also conduct several robustness checks including a simultaneous equations estimation of the return and risk effects resulting from focus (diversification).

3.1 Test of hypothesis H.1: Effect of focus on bank returns

The hypothesis H.1 stated in the Introduction in terms of bank diversification is restated below in terms of bank focus.

H.1: The relationship between bank returns and focus is non–linear and U–shaped in bank risk. To be precise, when loans have low exposure to sector downturns (downside risk), focus has little impact for a bank's returns; focus affects a bank's returns most adversely when loans have moderate downside risk; when loans have sufficiently high downside risk, focus may actually enhance a bank's returns.

We first consider the linear regression

$$\text{Return}_t \;=\; \alpha_0 + \alpha_1 * \text{I–HHI}_t + \alpha_2 * \text{A–HHI}_t + \alpha_3 * \text{G–HHI}_t + \epsilon_t. \tag{3.1}$$

The null hypothesis we want to test is that diversification is better for bank returns ("Don't put all your eggs in one basket"), i.e., by implication that focus is harmful to bank returns:

$$\alpha_1 < 0,\ \alpha_2 < 0,\ \alpha_3 < 0. \tag{3.2}$$

As noted before, Return_t is proxied by four variables: (i) return on assets–ROA, (ii) return on equity–ROE, (iii) stock return–SR, and (iv) market or beta–adjusted stock return–BSR. The regressions are run by pooling all the observations across all banks and across all years.

In addition, we employ the following control variables for each bank: log of its size–SIZE, its equity to assets ratio–EQRATIO, its branch to assets ratio–BRRATIO, its employment expense to assets ratio–EMPRATIO, and the ratio of its doubtful and non–performing loans to assets–DOUBT (the risk measure). Time-dummies are introduced for 1994 through 1999 to control for any temporal fixed effects. Similarly, bank fixed effects are introduced to ensure that pooling of time–series observations for an individual bank with cross–sectional observations across banks does not generate spurious statistical significance of estimated coefficients.

The effect of focus (diversification) on bank returns may not be captured completely through a contemporaneous relationship. If information about a bank's decision to focus or diversify is publicly available to the capital markets, then the share prices and hence stock returns should adjust contemporaneously. However, this may be less true for adjustments in book measures of bank return (return on assets–ROA, and, return on equity–ROE). Hence, we also consider the specification in equation (3.1) above with one year lagged values of focus measures: I–HHI_{t-1}, A–HHI_{t-1}, and G–HHI_{t-1}.

Next, we test the hypothesis that, in contrast to the specification in equation (3.1), the return–focus relationship is in fact non–linear and U–shaped in bank risk, as implied by hypothesis H.1 above (see the discussion in the Introduction of the paper). Put another way, the hypothesis states that bank risk interacts with bank focus in a U–shaped manner in explaining the cross–sectional variation across banks in the return–focus relationship. Mathematically, this is equivalent to the statement that the effect of focus on returns,

d(Returns)/d(Focus), is U–shaped in risk, reaching its minimum at moderate levels of risk. To try to capture this, we modify equation (3.1) by introducing interaction terms between the focus measures and a measure of risk, the non–performing and doubtful loans (RISK) as well as risk squared (RISK^2). That is:

$$\begin{aligned}\text{Return}_t &= \alpha_0 + \alpha_1 * \text{I–HHI}_t + \alpha_2 * \text{A–HHI}_t + \alpha_3 * \text{G–HHI}_t + \eta * Z_t + \beta_0 * \text{RISK} + \\ &\quad \beta_{11} * \text{I–HHI}_t * \text{RISK} + \beta_{12} * \text{I–HHI}_t * \text{RISK}^2 + \\ &\quad \beta_{21} * \text{A–HHI}_t * \text{RISK} + \beta_{22} * \text{A–HHI}_t * \text{RISK}^2 + \\ &\quad \beta_{31} * \text{G–HHI}_t * \text{RISK} + \beta_{32} * \text{G–HHI}_t * \text{RISK}^2 + \epsilon_t, \end{aligned} \tag{3.3}$$

where Z_t is a vector representing the non–risk control variables stated above. Under this specification, the effect of focus on returns is quadratic in risk. For example, for industrial focus, I–HHI:

$$\text{d(Return)/d(Focus)} = \alpha_1 + \beta_{11} * \text{RISK} + \beta_{12} * \text{RISK}^2. \tag{3.4}$$

Thus, the hypothesis that the effect of a bank's focus on its returns is U–shaped in its risk takes the form:

$$\beta_{11} < 0,\ \beta_{12} > 0,\ \beta_{21} < 0,\ \beta_{22} > 0,\ \beta_{31} < 0,\ \beta_{32} > 0. \tag{3.5}$$

As stated above, the measure of bank RISK employed in the regression above is the ratio of doubtful and non–performing loans to assets, DOUBT_t. For sake of robustness, we employ two other measures of RISK: (i) AVGDOUBT, the average of each bank's risk exposure, i.e., the average of DOUBT_t for each bank over the entire time-period of our sample, 1993–1999; and (ii) PREDOUBT, the predictable component of each bank's risk computed from a regression of DOUBT_t on our measures of Focus (HHI's). In other words, we treat DOUBT_t as an endogenous variable as specified in equation (3.6) and look at its predicted value.[17] These latter measures are potentially more attractive as *ex–ante* measures of bank risk.[18]

INSERT TABLE 3 HERE.

[17] We also employed two additional measures: (i) PROVISIONS, the ratio of loan loss reserves for expected losses reported by each bank in its balance–sheet to its assets, and (ii) (1 – EQRATIO), one minus the bank's (Tier–1) equity ratio EQRATIO, the latter being inversely related to bank risk. Both measures produced qualitatively similar results with slightly weaker effects for the case of PROVISIONS as the risk measure. For sake of expositional consistency with the rest of the paper, we state our results using risk measures that are based on DOUBT, the doubtful and non–performing loans to assets ratio.

[18] Moreover, the ex–post measure is more likely to be correlated with current returns. This correlation arises due to a simple accounting relationship: when realized losses are high, return is low.

Table 3 presents the results for linear regressions of bank returns on focus specified in equation (3.1) with return on assets (ROA), return on equity (ROE), unadjusted stock return (SR), and market or beta–adjusted stock return (BSR) employed as alternative bank return measures.[19] The null hypothesis that focus reduces bank returns (and thus diversification increases bank returns) is rejected for all three measures of lending focus: industrial and household focus (I–HHI), broad asset sector focus (A–HHI), and geographic focus (G–HHI), as reflected in the positive and statistically significant (mostly at 1% confidence level) coefficients on these measures.[20]

INSERT TABLES 4A, 4B, 4C, 4D HERE.

We also tested the link between focus and bank returns employing a broader specification which introduces the control variables, bank size (SIZE), bank capital ratio (EQRATIO), branch to assets ratio (BRRATIO), employees to assets ratio (EMPRATIO), risk of bank loans (DOUBT), and the year dummies for time fixed–effects, into the regression. The results from this broader specification are contained in Table 4A. The inclusion of these variables significantly enhances the explanatory power of equation (3.1). For brevity we only report results for the return measures ROA and SR. The control variables for a bank's capital ratio and the risk of its loans (doubtful and non–performing loans to assets ratio) are strongly significant in their effect on ROA but have a less significant impact on the bank's stock return (SR).

In Table 4B, we enhance the specification employed in Table 4A by adding bank–specific fixed effects. The motivation for introducing bank–specific fixed effects stems from a concern that if there is not adequate time–series variation in the balance–sheet and return observations for a bank, then pooling its time–series observations may spuriously increase the statistical significance of estimated coefficients. Results in Table 4B illustrate however that this does not affect our results. As before (Table 4A), all the focus measures (I–HHI, A–HHI, and G–HHI) have a positive and statistically significant effect on bank return measures, even after allowing for bank–specific fixed effects.

In Table 4C, we replace the focus measures (HHI_t) by their one–year lags (HHI_{t-1}). The results are very similar to the specification with contemporaneous focus measures. In Table 4D, we consider the specification which employs the contemporaneous focus measures, HHI_t, and the increase in focus measures, HHI_t - HHI_{t-1}. In the presence of contemporaneous

[19]Note that all standard errors reported in the tables are corrected using White's adjustment for heteroscedasticity. Examination of lags (VIF statistic in SAS program for multiple regression) did not reveal a significant auto–correlation problem in our data.

[20]Note that the sample size is much smaller for the stock return based measures of bank returns since only 34 out of our 105 banks are publicly traded.

focus, the increase in focus (HHI_t - HHI_{t-1}) appears to have little additional explanatory power.

INSERT TABLES 5A, 5B, 5C, 5D HERE.

Tables 5A–5D test whether the return–focus relationship is non–linear and U–shaped in bank risk, thus linking the cross–sectional effect of focus on returns to the level of bank risk (see equation 3.3). Table 5A employs the doubtful and non–performing loans to assets ratio ($DOUBT_t$) as the measure of bank risk (RISK). Table 5B allows for bank–specific fixed effects in the specification of equation 3.3. Table 5C employs the average of the realized doubtful and non–performing loans to assets ratio for each bank over the entire sample period 1993–1999 (AVGDOUBT) as the measure of bank risk. Finally, Table 5D employs the predicted value of DOUBT obtained through a regression of DOUBT on focus variables (equation 3.6 below) as the measure of bank risk ($PREDOUBT_t$).

As can be seen, Tables 5A, 5C, and 5D provide support for the U–shape hypothesis describing the relationship between focus and returns conditional on the risk level of the bank. The coefficients on the interaction terms, $HHI_t * RISK$, and $HHI_t * RISK^2$, are negative and positive, respectively, and statistically significant. This holds for both measures of bank returns, ROA and SR, for all three measures of focus, I–HHI, A–HHI, and G–HHI, and for all three versions of bank risk, DOUBT, AVGDOUBT, and PREDOUBT.[21] Table 5B confirms that the significance of these coefficients is not affected by the introduction of bank–specific fixed effects. The U–shape hypothesis continues to hold though the coefficients on the quadratic interaction terms are less significant statistically than under Table 5A.

INSERT FIGURE 2 AND TABLE 6 HERE.

To understand the economic significance of this U–shape relationship, Figure 2 plots the marginal effect d(ROA)/d(Focus) for different values of DOUBT for all three measures of Focus, I–HHI, A–HHI, and G–HHI, based on Table 5A, Column 2 (for ROA) coefficients. The range of DOUBT is taken to be between 0% and 50% which covers the minimum (zero) and the maximum value (45%) over our sample period. Table 6 presents the minimum, 10 percentile, 25 percentile, 50 percentile, 75 percentile, 90 percentile, and the maximum values for DOUBT (ranked across all banks) for each of the years, 1993 through 1999. Note that mean (median) doubtful and non–performing loans to assets ratio over the entire sample period is 5% (3%) with a standard deviation of 5.6%.

[21] The results are somewhat weaker for stock return as the measure of bank returns compared to ROA. Also, in Table 5D, when PREDOUBT is employed as the measure of risk, the coefficients on the linear interaction terms are statistically insignificant for I–HHI and A–HHI though all coefficients have the correct signs.

As can be seen from Figure 2, for the mean (median) bank in our sample, the effect of a small increase in industrial focus on returns (I–HHI) is very small and positive. Importantly, the effect of a small increase in industrial focus is *uniformly positive* for the entire range of DOUBT values. This positive effect rises sharply as bank risk increases above a DOUBT value of about 10%. In other words, for most banks in our sample (banks with moderate levels of risk), industrial focus has a relatively small positive effect on bank returns. However, for the few banks in our sample with very high levels of risk, industrial focus has a large positive effect on bank returns.

On the other hand, a small increase in asset sectoral focus (A–HHI) and geographic focus (G–HHI) has a small and negative effect on returns for the mean (median) bank. Specifically, the effect of a small increase in asset sector focus is negligible for bank returns for a DOUBT level up to 15% (which represents about the 85th percentile in the bank sample) and is positive and increasing sharply for banks with DOUBT greater than 15%. In fact, the positive effect of focus on returns at high risk levels is stronger for broad asset sector focus than for industrial focus. However, a small increase in geographic focus has a negative effect on returns for most banks in our sample, reaching its minimum between DOUBT values of 15–25% and becoming positive only at extremely high levels of risk (DOUBT values greater than 37.5%). Alternatively, diversification across sectors and geographical regions is beneficial for the returns of moderate risk banks, but is costly for very high risk banks.

This lends empirical support to Winton (1999)'s hypothesis that diversification (focus) has a "slight" benefit (cost) at low bank risk levels, has maximum benefit (cost) at moderate risk levels, and in fact, hurts (helps) bank returns at very high risk levels. Indeed, we find that for industrial focus, there is only a cost (and no benefit) associated with diversification for banks in our sample. It is important to note however that examining bank returns is only one side of the tradeoff between return and risk. We examine next the other side of the tradeoff: the effect of the decision to focus (diversify) on bank loan risk.

3.2 Test of hypothesis H.2: Effect of focus on bank loan risk

The hypothesis H.2 stated in the Introduction in terms of bank diversification is restated below in terms of bank focus.

H.2: A bank's monitoring effectiveness may be lower in newly entered and more competitive sectors, and thus, being focused can result in a superior quality of loans and reduce the bank's risk of failure.

In order to study the effect of focus (diversification) on bank monitoring incentives, and in turn, on the quality of bank loans, we consider first the risk of bank loans as a dependent

variable in the regression

$$\text{RISK}_t \;=\; \gamma_0 + \gamma_1 * \text{I–HHI}_t + \gamma_2 * \text{A–HHI}_t + \gamma_3 * \text{G–HHI}_t + \eta * Z_t + \theta * \text{RISK}_{t-1} + \epsilon_t, \tag{3.6}$$

where, as before, Z_t are the non–risk control variables, and risk is proxied by the variable DOUBT_t. Then, the simplest version of hypothesis H.2 (discussed in the Introduction) is the null hypothesis that an increase in focus (increase in HHI) reduces the risk of bank loans.

$$\gamma_1 < 0,\ \gamma_2 < 0,\ \gamma_3 < 0. \tag{3.7}$$

Moreover, entering into "new" loan sectors may adversely affect the bank loan quality due to lack of monitoring specialization and/or due to poor monitoring incentives.[22] To test this aspect of hypothesis H.2, we introduce the first difference in bank focus measures as a variable to track an inter–temporal increase in bank focus (i.e., a decrease in bank diversification):

$$\begin{aligned}\text{RISK}_t \;=\; & \gamma_0 + \gamma_1 * \text{I–HHI}_t + \gamma_2 * \text{A–HHI}_t + \gamma_3 * \text{G–HHI}_t + \eta * Z_t + \theta * \text{RISK}_{t-1} + \\ & \delta_1 * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) + \delta_2 * (\text{A–HHI}_t - \text{A–HHI}_{t-1}) + \\ & \delta_3 * (\text{G–HHI}_t - \text{G–HHI}_{t-1}) + \epsilon_t. \end{aligned} \tag{3.8}$$

An inter–temporal increase in focus (a decrease in diversification), i.e., $\text{HHI}_t - \text{HHI}_{t-1} > 0$, should reduce bank risk:

$$\delta_1 < 0,\ \delta_2 < 0,\ \delta_3 < 0. \tag{3.9}$$

We also introduce an additional variable, COMP, that measures the extent of competition a bank faces in its top five industries (by exposure amounts) in the non–financial and household part of the portfolio. Formally, COMP for bank i is measured as $\sum_{j=1}^{5}[\ 1 - (X_{ij}/R_j)\ ]$, where $R = \sum_{j=1}^{N} X_{ij}$, the total exposure across all banks (1 through N) to industry j. Note that COMP is higher for bank i if its exposure to the (top 5) industries it lends to is smaller compared to the exposure of the other banks to the same set of industries, i.e., it is a smaller player in lending to these industries, and thus, likely to face greater competition and adverse selection when it expands into these industries.

To test a potential "winner's curse" effect, we consider a modification of regression (3.8) by introducing an interaction term between the measure of competition faced by the bank

[22] As noted before, we use the term "new" for industries in the sense that previous exposures of the bank to these industries had been lower or non–existent.

and the change in its industrial focus (I–HHI$_t$ - I–HHI$_{t-1}$):

$$\begin{aligned} \text{RISK}_t &= \gamma_0 + \gamma_1 * \text{I–HHI}_t + \gamma_2 * \text{A–HHI}_t + \gamma_3 * \text{G–HHI}_t + \eta * Z_t + \theta * \text{RISK}_{t-1} + \\ &\quad \delta_{11} * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) + \delta_{12} * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) * \text{COMP}_t + \\ &\quad \delta_2 * (\text{A–HHI}_t - \text{A–HHI}_{t-1}) + \delta_3 * (\text{G–HHI}_t - \text{G–HHI}_{t-1}) + \epsilon_t. \end{aligned} \tag{3.10}$$

The null hypothesis is that d(RISK)/d(Increase in Focus) is decreasing in the extent of competition, i.e., the interaction term above has a negative coefficient.[23]

$$\delta_{12} < 0. \tag{3.11}$$

INSERT TABLE 7 HERE.

Table 7 presents the empirical evidence on how the decision to focus or diversify affects endogenously the risk of bank loans by reporting the results for the tests specified in equations (3.6) through (3.11) above. The risk of bank loans is proxied by the doubtful and non–performing loans to assets ratio (DOUBT$_t$). The first column of Table 7 tests the hypothesis based on the preliminary specification in equation (3.6), the second column tests the hypothesis based on the specification in equation (3.8) where we employ the first difference in focus measures (HHI$_t$ - HHI$_{t-1}$) as explanatory variables, and the third column tests the hypothesis based on the specification in equation (3.10) where we also employ the interaction term between the change in industrial focus and the extent of competition in the lending sector faced by the bank [(I–HHI$_t$ - I–HHI$_{t-1}$) * COMP$_t$].

An interesting pattern emerges from Table 7. From Column 1, we see that industrial and asset sector focus (I–HHI and A–HHI) reduces the risk of bank loans as indicated by the negative and statistically significant (at 5% confidence level) coefficients on these measures of focus. However, geographical focus (G–HHI) increases the risk of bank loans. This suggests that diseconomies in bank monitoring arise more from expansion across industries and asset sectors rather than from geographical expansion. This difference is further confirmed in Column 2 where we employ the first difference in focus measures as explanatory variables. When a bank increases focus over time by lending more to fewer industries or asset sectors (I–HHI$_t$ > I–HHI$_{t-1}$, A–HHI$_t$ > A–HHI$_{t-1}$), there is a decrease in the risk of it loans. However, an increase in geographical focus (G–HHI$_t$ > G–HHI$_{t-1}$) seems to have little effect on loan risk.

[23]Note that if diversification has an effect on bank risk due to (agency) costs associated with any corresponding increase in the bank size, increase in the number of branches or employees, then such effects should get at least partially captured through the coefficients in the regressions on the control variables: SIZE, BRRATIO, and EMPRATIO.

Finally, Column 3 reveals that when a bank diversifies by entering into new industrial sectors, loan risk increases at a rate that is increasing in the extent of competition that the bank faces in the (five largest) industries it has a loan exposure to. The coefficient on the interaction term [(I–HHI$_t$ - I–HHI$_{t-1}$) * COMP$_t$] is negative and significant suggesting that an increase in focus, i.e., a decrease in diversification, reduces risk more when the competition that the bank faces in its loan sectors is smaller. This provides evidence supporting the "winner's curse" hypothesis that banks face greater adverse selection when they expand into industries that have been previously penetrated by their competitors. This also suggests that if banks take this effect of competition into account and are value–maximizing, then they should choose to diversify (if at all) in industries with a lower penetration by other banks, as proposed by Boot and Thakor (2000). This would mitigate the adverse effect of industrial or sectoral diversification on their loan quality.

3.3 Simultaneous estimation of return and risk regressions

As a robustness check to these results, we consider the effect of focus on bank returns (ROA, SR) and bank risk (DOUBT), where both return and risk are treated as endogenous variables simultaneously estimated using Seemingly Unrelated Regression (SUR) technique (see Johnson, 1972, Maddala, 1977, and Theil, 1971):

$$\begin{aligned}\text{Return}_t &= \alpha_0 + \alpha_1 * \text{I–HHI}_t + \alpha_2 * \text{A–HHI}_t + \alpha_3 * \text{G–HHI}_t + \\ &\quad \eta_p * Z_t + \theta_p * \text{RISK}_{t-1} + \omega_p * \text{Return}_{t-1} + \\ &\quad \beta_{11} * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) + \beta_{12} * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) * \text{COMP}_t + \\ &\quad \beta_2 * (\text{A–HHI}_t - \text{A–HHI}_{t-1}) + \beta_3 * (\text{G–HHI}_t - \text{G–HHI}_{t-1}) + \epsilon_{pt}, \end{aligned} \tag{3.12}$$

$$\begin{aligned}\text{RISK}_t &= \gamma_0 + \gamma_1 * \text{I–HHI}_t + \gamma_2 * \text{A–HHI}_t + \gamma_3 * \text{G–HHI}_t + \\ &\quad \eta_r * Z_t + \theta_r * \text{RISK}_{t-1} + \omega_r * \text{Return}_{t-1} + \\ &\quad \delta_{11} * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) + +\delta_{12} * (\text{I–HHI}_t - \text{I–HHI}_{t-1}) * \text{COMP}_t + \\ &\quad \delta_2 * (\text{A–HHI}_t - \text{A–HHI}_{t-1}) + \delta_3 * (\text{G–HHI}_t - \text{G–HHI}_{t-1}) + \epsilon_{rt}. \end{aligned} \tag{3.13}$$

Note that under SUR estimation, the residuals ϵ_{pt} and ϵ_{rt} are allowed to be heteroscedastic and correlated. The possibility of a correlation between the two residuals implies that the two regressions may be "related." The t–statistics from the estimation of the SUR system above are thus corrected for heteroscedasticity as well as for correlation of residuals.

INSERT TABLE 8 HERE.

The simultaneous estimation results in Table 8 provides a robustness check for our results on the effect of focus on bank returns (Tables 3, 4) and on the effect of focus on bank risk (Table 7). Consistent with results in Tables 3 and 4, the overall effect of all three focus measures is to improve bank returns on average as implied by the positive and statistically significant coefficients on I–HHI, A–HHI, and G–HHI, for both ROA and SR. Similarly, industrial and sectoral focus reduces bank risk, whereas geographic focus increases bank risk, as in Table 7.

3.4 Overall effect of focus on bank performance

Combining the empirical findings of Tables 3 through Table 8 on the effect of diversification on bank returns (hypothesis H.1) and bank loan risk (hypothesis H.2), we summarize our results in Figure 3.

We conclude that for our sample of Italian banks:

1. Industrial diversification results in an inefficient tradeoff between risk and return for all banks: return declines with diversification, and simultaneously, loan risk increases. This implies an overall deterioration in bank performance.

2. Broad asset sectoral diversification results in an inefficient tradeoff between risk and return for banks with very high risk levels: for these banks, return declines with diversification, and simultaneously, loan risk increases. Again, this implies an overall deterioration in bank performance.

3. Geographic diversification results in an improvement in the tradeoff between risk and return for banks with moderate risk levels: for these banks, return improves with diversification and so does loan risk. This implies an overall improvement in bank performance.

4. The effect of asset sectoral diversification on banks with moderate risk levels, and the effect of geographical diversification on banks with very high risk levels cannot be assessed without taking a stand on how much should bank return increase per unit increase in bank risk.

Figure 3: Summary of the Effect of Diversification on Bank Return, Risk, and Performance

	Moderately Risky Banks	Highly Risky Banks
Industrial Diversification	Return ↓ Risk ↑ ⇒ Decreased Performance	Return ↓ Risk ↑ ⇒ Decreased Performance
Sectoral Diversification	Return ↑ Risk ↑ Effect on Performance Ambiguous	Return ↓ Risk ↑ ⇒ Decreased Performance
Geographic Diversification	Return ↑ Risk ↓ ⇒ Improved Performance	Return ↓ Risk ↓ Effect on Performance Ambiguous

Crucially, Figure 3 implies that the "conventional wisdom" of not putting all eggs in one basket cannot be applied uniformly across all banks. Our results also point out a potentially important economic difference between diversification that is achieved through industrial or asset sectoral exposures and diversification that is achieved through geographical expansion.

4 Discussion and Conclusion

In this paper, we examine the effect of a bank's decision to focus (diversify) on its return and risk. Understanding these two effects enable us to derive conclusions on the overall effects of focus or diversification on a bank's performance. Indeed, we believe that this is the first paper to compute and employ measures of focus (diversification) based on industrial and

sectoral exposures in individual bank asset portfolios. Our tests are based on a unique data set of 105 Italian banks over the sample period 1993–1999.

Our results have implications for the optimal size and scope of a "bank". While traditional banking theory based on a delegated monitor argument (see, for example, Boyd and Prescott, 1986) recommends that the optimal organization of a bank is one where it is fully diversified, our results suggest that empirically, there seem to be diseconomies of diversification for certain banks. These diseconomies arise in the form of poor monitoring incentives and/or greater credit risk of loan portfolios when a bank expands into too many industries or asset sectors given its monitoring capabilities. This finding complements the agency theory based analysis of the boundaries of a bank's activities as proposed in Cerasi and Daltung (2000) among others, and also suggests that the optimal industrial organization of a banking sector might be one that comprises several focused banks instead of a large number of diversified banks, an outcome that may also be attractive from a systemic risk standpoint as noted by Acharya (2001) and Shafffer (1994).

From a normative standpoint, our results suggest a cautious warning flag to regulators regarding the adoption of regulatory mechanisms that encourage complete bank–level diversification. A similar caveat applies to the attempts to measure credit portfolio risk through traditional diversification measures without bank–specific risk–return measurements. Our results also help explain the results of DeLong (2001) who finds that bank mergers that are focusing (in terms of geography and activity) produce superior economic performance relative to those that are diversifying.

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