Loan officer reliance on hard information: Empirical investigation on the role of banking competition

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Abstract

Using a unique data set of credit file retrieved from one of the three major French banks, we investigate whether banking competition affects the loan officer production of particular form of information considering the whole of bank-firm relationship framework. Our data set allows us to introduce direct measure of hard and soft information used by loan officer during the credit underwriting process, as well as the other sources of bank revenues from its relationship with firms such as its prior credit extension, its saving services provided, and the sale of arm's length services to them. We show that the amount of bank revenues from the saving related activities with firm increases the loan officer's production of soft information. We follow Hannan (1997) by decomposing the HHI into two terms; we found that both the number of lender relationships and bank financing share affect the information generated by the loan officer by reducing the value of soft information produced by him. Further, the different outcomes of our empirical study provide evidence that competition increases the loan officer reliance to hard information to the detriment of soft information.

Keywords: Bank competition, lending relationships, hard information, soft information.

JEL classification numbers: G21, G32

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Introduction

Collection, treatment, and production of private information about informational opaque borrower, such as the small-and medium-sized enterprises (SME), in order to minimize the information asymmetry in credit market, is one of the most important roles of banks that justify their presence in the economy (e.g., Diamond,1984; Ramakrishnan and Thakor,1984; Allen,1990). Recent literature identifies two forms of information gathered and utilized by financial intermediaries in their credit granting process: hard information and soft information. Petersen (2004) proposed definitions of hard and soft information based on the processing and collection procedures used for each kind of information. According to the author, hard information is information which is quantitative, detached from the person who collect it, can easily be stored and transmitted and is more adapted to the new communications technologies used by banks. Mainly, the financial intermediation literature identifies hard information with "transactions-based lending", Berger and Udell (2002), Stein (2002), Petersen and Rajan (2002), Berger et al. (2005), among others, provide support for this link. In contrast to hard information, soft information is qualitative information about the borrower's creditworthiness which cannot be expressed easily in score. Banks collect this information over time across multiple interactions with customers. Specifically, soft information is difficult to transmit and to evaluate, by consequence the information collector and the information user is usually the same. In academic literature, the soft information is generally linked to the relationship lending technology (e.g., Berger and Udell, 2006; Hauswald and Marquez, 2006).

An increasing number of researchers in lender-borrower context combine hard and soft information in their analysis. First strand of studies link the type of information used in the lending process, to the institutional structure. Stein (2002) provides support that more hierarchical firms are more able to use hard information because of its ability to be transmitted across organizational levels. Based on his conclusions, he expects a wave of mergers between financial institutions in the wake of the growing use of credit scoring technology by lenders. Consistent with the model devised by Stein, Berger et al. (2005) empirically show the better ability of small financial intermediaries in collecting and processing soft information than larger banks. Specifically, they find that the later group is less likely to grant credit for informationally opaque borrower. Second strand of works that investigates the dichotomy between soft and hard information as the two forms of information produced by banks, used geographical or hierarchical distance between lender and borrower

as a proxy for presence of soft information in bank-firm relationships. The underlying idea is that bank collects this information over time through frequent contact with clients and often this information must be communicated to the loan approving officer. Therefore, the use of soft information needs a closer geographical or hierarchical distance given its reliance to the person who collects it and the difficulty to transmit it within the organization. Berger et al. (2005), De Young et al. (2008), Liberti and Mian (2009) and Agarwal and Hauswald (2010) empirically substantiate a positive link between bank-borrower distance and the use of hard information[3]. More recent studies on this issue emphasize the role of bank-loan officers in producing soft information. They assume that the relevant level of lender-borrower relationship on SME lending market is the loan officer-entrepreneur relationship instead of bank-firm relationships. Indeed, according to their assumption, the loan officer himself conducts the underwriting phase, and is responsible for the firm's monitoring after credit granting. This direct contact of loan officer with borrower allows him to collect, handle and communicate soft information about customers. So, given the difficulties to transmit this form of information across physical or organizational distances without affecting its pertinence due to institutional frictions (e.g., Stein, 2002; Petersen, 2004; Berger et al., 2005), it is more relevant to investigate the production of soft information at the loan officer-firm relationship level (Berger and Udell, 2002). Scott (2006) presents evidence that rotation of loan officer, a proxy for the production of soft information by loan officer, reduce credit availability for small and information opaque firms. Hertzberg et al. (2010) investigate a closely related question of how the loan officer turnover affects his reporting behavior. They find significant changes in terms of quality and accuracy of his reports when he anticipates rotation. More recently, Uchida et al. (2012) examine more directly the production of soft information by loan officer. They provide empirical evidence that production of soft information about SME by financial institution is bound to loan officer activities. Cerqueiro et al. (2011) document closely related issue. They provide empirical support to the link between the loan officer use of soft information in loan rate setting process which they identify as "discretion" and the dispersion in interest rates on loan granted by banks to SME. Although the forms of information used by financial institution, as discussed above, are important in the credit underwriting process, direct empirical works on the determinants of the use of particular type of information (hard versus soft) by banks through loan officer activities are somewhat limited.

[3] See Dell'Ariccia and Marquez (2004) for theoretical underpinning on this issue.

Recent theoretical research has established a relationship between banking competition and the loan officer incentives to produce and utilize certain form of information (hard versus soft). Related to the literature on "delegated expertise" and based on multi-task model, Heider and Inderst (2012) present a theoretical model to analyze relationship lending through loan officer behavior, when the latter in addition to his traditional tasks related to gathering and processing soft information, is motivated to prospect new borrowers. The feature of their study is to consider the strategic dimension of loan officers' prospecting effort, beyond traditional analysis framework, which limits loan officer's tasks of screening loan demand and monitoring borrowers. This model seems to provide complete picture about the role of loan officer, in contemporary financial institution, who is required to have skills of "loan seller" in order to extend financial intermediaries' business and prevent competition from other banks. Moreover, banks often pay commission to loan officers based on the number of loans they originate as part of their salary. Hence, in light of these considerations, Heider and Inderst (2012) devised multi-task loan officer model which analyze how the stress between different tasks of loan officers may affect banks' use of soft and hard information, loan officers' compensation, and lending standards, within the contexts of bank competition as well as the diffusion of credit scoring technology. The results of their paper show that when banking competition increases, financial institutions, across loan officers, overlook soft information utilization and at the same time banks enhance its reliance to hard information which is less expensive in terms of time and efforts. This theoretical underpinning of multi-task loan officer expertise suggests some interesting empirical implication: if loan officer plays a prospective role in addition to his traditional tasks, we would expect to observe the relationship between banking competition and loan officer production of information.

The purpose of our paper is to investigate empirically the relationship between banking competition and the form of lender information production at the level of loan officer activities in accordance with the recent literature on relationship lending that emphasizes the importance of loan officer in producing private information. We will use a unique detailed data set retrieved from one of the three large French banks. This data contains very detailed information on various firms' characteristics, loan conditions, competition, and individual bank-borrower relationships over time. Richness of data allows us to distinguish between the loan officer use of hard information based in audited financial statements, the firm's tax return and payment information on one hand and on the other, soft information produced by him about firm's applicant for credit. The Soft information produced by loan officer consists on his assessments of the SME owner's character, his managerial capabilities, market positioning of

the firm and its environment, and finally the financial support that SME can found nearby. The soft information is represented under numerical score from zero to twenty.

Prior theoretical studies claim the existence of linkage between competition and bank's production of information (e.g., Hauswald and Marquez, 2006), some current empirical works have examined this connection. However, these studies have focused on borrower lender relationships without considering the role of the loan officer in generating those benefits.

Our analysis not only consists an empirical application of existing theoretical model presented above or a replication of empirical existing studies, but also try by using empirical model to extend analyses conducted elsewhere. The contribution of paper consists of:

First, we build our analysis in line with conceptual framework devised by Berger and Udell (2006) which examined the idea of soft and hard information from the point of view of the choice of lending technology. Our data concerns only SMEs' market loan of the bank by focusing merely on the relationship lending technology used by the financial institution through its loan officer activities. Further, our analysis refines Berger and Udell (2006) framework by considering the real forms of information used by the loan officer for each credit application within the lender-borrower relationship technology itself. Indeed, in his relational loan application analysis, loan officer must combine hard and soft information in his assessment of firm's credit worthiness. For instance, loan officer can use audited financial statements and payment information to obtain internal credit scoring of firms, besides he utilizes the benefit of his established contact with borrower (which can previously be a client or potential customer) to generate soft information. Thus the association of the two forms of information provides him a more clear idea about borrower's profile for credit decisions. However, during this credit underwriting process, some factors as banking competition may affect loan officer behavior and enhance his reliance to particular type of information to the detriment of the other form of information within the lender-borrower relationship technology itself.

Second, our study contributes to the small strand of empirical literature about the determinants of information production by loan officers. Among the works dealing with this topic, our analysis use different and direct measure of loan officer production of soft information which includes only non financial information without resorting to different proxies like loan officer rotation or the frequency of contact with borrower (e.g., Scott, 2006; Uchida et al., 2012). To the best of our knowledge, only Norden and Grunert (2012) used

such measure as independent variable to investigate the effect of hard and soft information on borrower's bargaining power.[4]

Third, we use a complete bank-SME relationship framework for our analysis, so we introduce variables which control for the whole income of lender-firm relationships such as: prior credit extension, its saving services provided, and the sale of arm's length services for the last twelve months. This variable considers for the Net banking incomes of the financial institutions with the SME applicant for loan.

Our results show that the competition increases the loan officer reliance to hard information to the detriment of soft information. Also, the consideration of the complete lender-firm relationship framework is important for loan officer to produce soft information.

The remainder of the paper is organized as follows. Section 2 describes how the loan officer produces information about firms during the credit underwriting process. Section 3 describes the data and methodology used in the present study. Main findings are discussed in section 4. Finally, section 5 concludes and offers some directions for future research.

2- Loan officer information's production process

Our analysis use data about loan officers' credit analysis retrieved from one of the major French banks. The credit underwriting process concerning SME funding in this bank is very dynamic involving multiple interactions between loan officer and borrower. Loan officer manage multiple firm-relationships which constitute its "client-portfolio" by screening credit applicants and monitoring outstanding loans. Also, he must develop the bank business with SME firms already customer of his bank and part of its "Client-portfolio" as well as to prospect for new borrowers. The decision of granting credit in the bank is enough decentralized regarding SME credit market and loan officer plays a central role even when the decision to grant the credit require the agreement of the hierarchy[5]. The organizational form of the financial institution from which we collect data, allows it to gather and produce soft information, in addition to hard information.

All the SME credit application is treated by loan officers through a complete reasoned credit analysis in order to evaluate the feasibility of the firm's project and its ability to repay. For example loan officer study include a fully assessment of the bank-SME relationships business history at the time of application in term of prior credit's commitment and net banking income from the firm during the prior years, the cash flow in the SME saving account. Also, he must

[4] Others previous studies used the same dataset base and same variable but to analyze others topics see for example Elsas and Krahnen (1998); Grunert et al. (2005).

[5] He may be physically present at all the level of credit committees and can explain what criteria he bases his decision to grant the credit.

consider the level of competition from the other banks to start a relationship with the firm, total debt of the firm etc. During this process loan officer have inevitably to evaluate the creditworthiness of the credit applicant by providing a rating for each of them during the credit underwriting process. This procedure involves two stapes:

First of all, using the last audited financial statements of the firm's applicant for the credit, its tax return and payment information, he calculates through an internal credit scoring system a SME-creditworthiness rating based only on financial criteria. The outcome can take numerical score form's, scaled from zero (the worst) to twenty (the best), or a fifteen letter designations, from A+ (the best) to Z (the worst)[6]. This first assessment helps loan officer to have a first insight about the firm soundness founded exclusively on hard information. We label it in this study *Hard information.*

The second stapes consist on the loan officer evaluation of non financial factors about the credit's applicant. It refers to the process of collecting private firm-specific information through his direct and multiple contacts with the SME owner's, the manager, employees, and firm's supplier. In other word all what can help loan officer to have a complete idea about the creditworthiness of the firm and which can't be detectable in the financial statement. For our data this stapes are standardize within the banks information system. Indeed, loan officer must answer twelve questions concerning four non financial fields:

1- Facility to have access to pertinent information about the firm and the aptitude of owner's to collaborate with loan officer: for example loan officer must assess the quality of financial statement, accounting strategy and their potential effect on the financial results, and transparency of management rules.

2- The ability of firm to mobilize financial support: for instance loan officer have to evaluate the incomes distribution policy, the willingness of shareholder to provide firm with the required equity capital and to carry the entrepreneurial risk, the ability to have external sources of funds from other financial institution or financial market.

3- Competition level of the firm's environment and its strategic positioning: loan officer examines the firm's market potential, the perspectives of its industry, the firm's product-market position and strategy, the sensitivity of the firm activity to the economic and financial cycle.

[6] letter designations are A+,A,A-,B+,B,B-, C+,C,C-, D+,D,D-, E+,E,E-, F,Z; from A+to E- we have the safe counterparties; Fand Z represent defaulting party.

4- The management: loan officers must give his appreciation about the SME management quality, the management skills and strategy, and the ability to operate business adversity.

For each questions loan officer has a range of response's choice which corresponds to a different notes. Informatics system calculates the total points earned by each firm and scale it from 0 the (worst) to 20 (the best). In our analysis we will call it *Soft information*

Finally, the combination of the two assessments using hard and soft information across sophisticated internal rating system allows the bank to calculate the final internal rating of the firm. Thus, the richness of these data allows us to pass through some key hurdles in investigating our issues.

3- Data and variable definitions:

The dataset used in this study is unique and is retrieved from one of the three major French banks. This data contains detailed information about the private information production of the bank's loan officers between the years of 2008 and 2011. Besides, the loan officer assessment of firm's applicant for credit (soft information) and its credit score based on audited financial statements (Hard information); we also got access to multiple firms' characteristics, loan conditions, competition, and individual bank-borrower relationships over time. It is clear that the use of data retrieved from one bank presents some limitations because it does not allow us to consider different bank loan officers information production behaviors and by consequence the relationship between banking competition and the form of lender information production in the French credit market. However, it seems that this is the only way to collect very detailed and accurate information relative to this issue given the privacy of the borrower-lender relationship.

3-1 Data

Present study investigates the impact of banking competition on the loan officer information production. The complete database contains 2154 observations concerning 1136 firms. Each observation represents a loan officers' valuation of firms' creditworthiness by using hard and soft information as explained above in preceding section. Our objective is to examine whether competition appears as one of the elements in determining the loan officer information production. For this purpose we use multiple data; the market data containing information of the credit-issuing bank's market share, and the credit-relationship variables related to each firm at the time of the loan officer's assessment. For every loan applicant, we extracted variables dealing with the characteristics of the customers, the strength of banking

relationships, and all of which could explain the level of private information production by loan officers. To complete our sample, we introduced information relative to the economic situation at the date of the loan officer analysis of the credit demand which could influence his SME creditworthiness evaluation. These are the business climate evaluation calculated by the French central bank for each type of industry to control for the general economic environment for which firms have to confront. In addition, we include three months Euribor rate and a short term rate index as a proxy of financial market stress. Finally, for the competition variable we generally follow Hannan (1997) and Ongena et al. (2012) by decomposing the HHI into two terms, the number of creditors from which firms borrow and the bank financing share of the loan officer's bank of the firm applicant for loan. We also, used the regional financing market share of the loan officer's financial institution to consider for his bank's lending behavior changes according to the bank's concentration in the region where the firm is located, also because we do not have access to French regional HHI.
The descriptive statistics of the variables are presented in the Appendix.

3.2 Definition of the variables

We explain the loan officer's qualitative assessment of the SME applicant for credit "*Soft information*" with economic conditions, firm characteristics, borrower-lender relationships, and competition as well as market structure variables. The definition and measurement of the variables is summarized in table 1.

The Business Climate of the firm's activity sector is an important element to anticipate borrower future's financial health and its ability to repay the loan. Thus, we expect the loan officer to consider the general economic environment under which firms have to evolve in his qualitative evaluation. For this reason we add the *Business Climate* Index control variable which is leading indicator for economic activity in France prepared by the French central bank. In addition, we include for the first group of explanatory variables, the monthly average of the three months Euribor rate related to the date of loan officer's assessment of the credit application. This variable controls for changes in the underlying cost of capital which can weaken the financial situation of the SME if it is already indebted in case of interest rate rise.
Among firm-specific variables, size is an important factor in determining the borrowing behavior of firms; theoretical models present it as an indicator of informational opaqueness or transparency of the firm. Indeed, loan officers may produce more soft information about large SME due to their more informational transparency than the smaller firms. We measure size as the log sales of the firm. We also include log value of the firm expected cash-flow which indicates whether or not the firm applicant for loan is able to generate liquidity in order to

repay credit and finance its development. We expect a positive sign for this variable. As well, we control for the firm's quality by including the log value of firm's age in years. Further, to control for the firm's opaqueness we add a variable which measure the period in months between the loan officer assessment dates and the date on which the accounts were closed for the audited financial statements available to loan officer.

We also consider borrower-lender relationships when exploring the loan officer's information production. Hence, to control for the strength of lending relationship we used traditional proxies:

- The log value of the duration of relationship between the bank and corporation measured in years.
- A dummy variable '*distance*' to account for the effect of the physical distance between the bank and the borrower. It equals "one" if the headquarters of the company is in close proximity[7] to the branch of the bank that granted the loan and zero otherwise.

Furthermore, we use for the first time, to the best of our knowledge, a variable which controls for the whole of lender-Firm relationships income for the last twelve months. This variable considers for the Net banking incomes of lender with the SME applicant for loan including all sources of the bank revenue such as its prior credit extension, its saving services provided, and the sale of arm's length services to them. We label this it *NBI.*

For competition variable we used the decomposed form of HHI index as used by Hannan (1997): the multiple bank relationships of the SME as demand-side determinant of competition assuming that the number of creditor is a corporate decision, however we control for supply-side determinants of banking competition by using the bank financing share of the loan officer's financial institution of the firm applicant for loan. To consider for the differing market powers of the lender, the bank's market share of corporate loans in the geographical location of the firm's applicant for credit at the date of loan officer's evaluation is used.

Finally, to consider for the differences in the industry profits, investment opportunities etc, we include five industry dummies.

The general reduced form of the model underlying empirical tests is:

$$\text{Soft information}_n = f\{\text{Economics Conditions, Firms characteristics, Relationship Variables,}$$

$$\textbf{Concentration Variables, Competition Variables, Control variables}\}$$

[7] If the headquarters of the firm is located in the same administrative region of the loan officer bank's branch.

Table II – Variable description

Dependent Variable	
Soft information	Loan officer's assessment of non financial firm's quality expressed on notes scaled from 0 (the worst) to 20 (the best)
Economics variables	
Euribor	The monthly Euribor 3-month average corresponding to the date of loan officer assessment
Business Climate	French monthly business sentiments index regarding different business sectors prepared by the French central bank. .
Firm characteristics	
Size	The log value of the last year firm's turnover.
Cash flow	The log value of the firm's expected cash-flow.
Firm age	The log value of the firm's age in years
Balance Sheet age	The duration between the loan officer assessment dates and the date on which the accounts were closed for the audited financial statements available for loan officer. .
Firms industry	
Trade	Variable equals one if firm is operating in commerce sector and zero otherwise.
Industries	Variable equals one if firm is operating in industrial sector and zero otherwise.
Services	Variable equals one if firm is operating in services sector and zero otherwise.
Construction	Variable equals one if firm is operating in construction sector and zero otherwise.
AAI	Variable equals one if firm is operating in Agriculture or Agri-Food Industry and zero otherwise.
Relationship Variables	
Duration	The log value of the relationship's duration between bank and firm in years.
Distance	Dummy variable equals one if the headquarters of the firm is in the same location of the loan officer's branch of the bank and zero otherwise.
Relationship Incomes Variables	
Net Banking Incomes	The total amount in Euro (in thousands) of the whole relationships earnings for the bank during the last twelve months.
Credit -NBI	The amount of bank revenues in Euro (in thousands) from the credit activities with firm during the last twelve months.
Off- Credit -NBI	The amount of bank revenues in Euro (in thousands) from off-credit relationship with firm during the last twelve months.
MLT-Credit -NBI	The amount of bank revenues in Euro (in thousands) from medium and long term's credit activities with firm during the last twelve months.
ST-Credit -NBI	The amount of bank revenues in Euro (in thousands) from short term's credit activities with firm during the last twelve months.
Saving -NBI	The amount of bank revenues in Euro (in thousands) from the saving relationship activities with firm during the last twelve months.
Arm's Length -NBI	The amount of bank revenues in Euro (in thousands) from arm's length services sale to SME during the last twelve months.
Market structure variable	
Market share	The bank's market share of corporate loans in the geographical location of the firm's applicant for credit at the date of loan officer's evaluation.
Competition Variables	
NBANKS	The number of bank relationships.
Log-NBANKS	The log value of the number of bank relationships.
Bank-Financing share	The loan officer's bank financing share of the firm applicant for loan indebtedness.

4- Empirical results

4-1 Univariate analysis

Before estimating the model presented above, we examine the additional value of the soft information for the credit applicant's assessment to that which is hard. The objective is to investigate if really qualitative evaluation of the loan officer is 'not just a replication of the firm's credit score based on financial statements. Thus, firstly we calculate rank correlations to better understand the influence of firm's credit score on loan officer production of soft information. For that, we used the same scale for *Soft information* and *hard information* variables; i.e. from 0 (the worst) to 20 (the best). Then, we calculate the spearman rank correlation coefficients between the *soft information* and hard information, by changing the scale of hard information represented by its fifteen rating level related to its letter designation from 1 (A+ rating, the best) to 15 (Z the worst). Table 3 reports the spearman rank correlation coefficients between the *soft information* and *hard information.*

Table 3: Rank correlation between Soft and Hard information

	Hard information 1 Score from 1 to 20	Hard information 2 Rating from A+ to Z
Soft information	0.0864 ***	-0.1308 ***

This table shows the spearman rank correlation coefficients between the soft information evaluation and hard information evaluation . Soft information is loan officer assessment of firm's quality scaled from 0 to 20. Hard information 1 is an internal credit scoring based on audited financial statements, scaled from 1 (the worst) to 20 (the best). Hard information 2 is a fifteen letter designation, from A+ (equal 1 for the test ,the best) to Z (equal 15 for test , the worst). ***,**,* denote correlation coefficients significances at 0.01, 0.05,and 0.10 levels

Table 3 indicates a weak significant rank correlation between *Soft information* variable and *hard information* variable under its two forms as explained above. Interestingly, even the loan officer's production of soft information takes numerical forms; it remains different from the credit scoring assessment. Thus, this result confirms that *soft information* variable measures the private information production of loan officer's about firms' applicant for credit.

4-1 Regression analysis

As explained above in section 2, the loan officer information production process in order to evaluate the firm's creditworthiness involves two steps. The calculation of firm's credit score by the internal credit rating system i.e. *hard information*, then qualitative evaluation of the SME by the loan officer's expertise i.e. *soft information.* The both outcomes of firm's assessment are used to provide the global internal rating of the firm. In reality, when the value of soft information assessment is higher than the *hard information* score based on audited financial statements, loan officer has to provide detailed and argued explanations about this situation. In other words, he must produce high quantity of soft information. We will explore this fact across our empirical methodology; hence if competition may reduce the production of the soft information by loan officer and push him to rely most on hard information assessment, it will decrease the numerical value of soft information variable provided by him in competitive environment. So, we explore the competition effect of the loan officer's soft information production by estimating the following OLS model with robust standard errors and clustered by firm to correct for the correlation across observations for given firm:

$$Soft\ information_{jit} = \propto + \sum_{k=1}^{K} \beta_{1K} Economic\ conditions + \sum_{n=1}^{N} \beta_{2n} Firms\ characteristics + \sum_{m=1}^{M} \beta_{3m} Relationship\ Variables + \sum_{z=1}^{Z} \beta_{4z} Relationship\ Incomes\ Variables + \sum_{f=1}^{F} \beta_{5f} Competition\ Variables + \varepsilon_{jit}$$

Where $Soft\ information_{jit}$ is the assessment of loan officer *j* of firm *i*, applicants for credit, based on non financial criteria at time *t.* Table 3 reports the results.

One of the most important elements that can influence the loan officer assessment behavior is the profit that bank can earn through the entire SME-bank relationship beyond the simple actual credit application. Thus, the first column contains our basic model which includes relationship incomes variable as the total amounts of the whole relationship earnings for the bank during the last twelve months. Then, we replace this variable by different detailed level of its components in columns two and three. Regression of column three is the full model.

First analysis of regression outcome shows that economic factors and relationship variables do not explain the loan officer's information production. Regarding firms characteristics, all variables are significant in explaining soft information except the variable of firm's age.

Table III – Determinants of loan officer's soft information production

The table reports the estimation results of OLS model with robust standard errors and clustered by firm to correct for the correlation across observations for given firm. The dependent variable is Loan officer's assessment of non financial firm's quality expressed on notes scaled from 0 (the worst) to 20 (the best). Standard errors are reported in parentheses**.**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Economics variables						
Business Climate	-0.0411	-0.0392	-0.0354	-0.0330	-0.0213	-0.0355
	(0.0269)	(0.0268)	(0.0267)	(0.0265)	(0.0285)	(0.0267)
Euribor	-0.301	-0.292	-0.296	-0.0597	-0.559	-0.223
	(0.669)	(0.672)	(0.670)	(0.906)	(0.704)	(0.672)
Firm characteristics						
Size	0.131***	0.125***	0.125***	0.128***	0.117**	0.128***
	(0.0455)	(0.0457)	(0.0459)	(0.0469)	(0.0465)	(0.0462)
Cash flow	0.201***	0.205***	0.184***	0.176***	0.167***	0.179***
	(0.0522)	(0.0534)	(0.0543)	(0.0555)	(0.0577)	(0.0545)
Firm age	-0.0307	-0.0277	-0.0215	0.0619	-0.0307	-0.0382***
	(0.117)	(0.117)	(0.116)	(0.106)	(0.117)	(0.0148)
Balance Sheet age	-0.0395***	-0.0388***	-0.0379**	-0.0340**	-0.0325**	-0.0382***
	(0.0147)	(0.0148)	(0.0147)	(0.0152)	(0.0146)	(0.0148)
Relationship Variables						
Duration	0.162	0.158	0.152	0.0685	0.0369	0.141
	(0.120)	(0.120)	(0.121)	(0.110)	(0.123)	(0.121)
Distance	0.00635	0.0144	0.0289	-0.00822	0.120	0.0315
	(0.170)	(0.170)	(0.168)	(0.160)	(0.174)	(0.169)
Relationship Incomes Variables						
Net Banking Incomes (NBI)	0.00133					
	(0.00777)					
Credit -NBI		-0.0136				
		(0.0202)				
Off- Credit -NBI		0.00496				
		(0.00751)				
Arm's Length -NBI			-0.00214	-0.00223	0.00197	-0.00160
			(0.00883)	(0.00860)	(0.00740)	(0.00863)
Saving -NBI			0.0824***	0.0736**	0.0808***	0.0830***
			(0.0314)	(0.0286)	(0.0288)	(0.0307)
MLT-Credit -NBI			0.00781	0.00752	0.00549	0.00967
			(0.0198)	(0.0195)	(0.0206)	(0.0198)
ST-Credit -NBI			-0.0438	-0.0527	-0.0495	-0.0657
			(0.0482)	(0.0509)	(0.0474)	(0.0430)
Market structure variable						
Market share	-42.23	-41.62	-41.43	-31.45	-53.70	-37.86
	(32.67)	(32.81)	(32.65)	(31.70)	(33.98)	(32.71)
Competition Variables						
Bank-Financing share	**0.00508****	**0.00527****	**0.00521****	**0.00517****	**0.00797*****	**0.00470***
	(0.00237)	**(0.00240)**	**(0.00239)**	**(0.00239)**	**(0.00251)**	**(0.00240)**
NBANKS	**-0.117****	**-0.109****	**-0.100***	**-0.0861**		**-0.245****
	(0.0511)	**(0.0522)**	**(0.0534)**	**(0.0525)**		**(0.0972)**
Years FE				-0.0146		
				(0.460)		
Log-NBANKS					**-0.455*****	
					(0.139)	
NBANKS squared						**0.0201***
						(0.0111)
Loan officers FE				yes		
Industry FE	yes	yes	yes	yes	yes	yes
Constant	36.23**	35.76**	35.33**	60.04	39.88**	33.90**
	(16.25)	(16.34)	(16.25)	(924.6)	(17.00)	(16.28)
Observations	865	865	865	853	759	865
R-squared	0.124	0.124	0.131	0.135	0.137	0.134

*** Significant at 1% level ; ** Significant at 5% level ; * Significant at 10% level

As we expect the saving side of the firm-lender relationship is important for loan officer in evaluating the quality of firms. The significance of the variable *saving -NBI* is high and consistent across all the specifications.

The purpose of our study is to investigate the impact of bank competition on loan officer production of soft information. Regressions results indicate that both, the number of firm's creditors and the bank financing share seem to impact the soft information production by the loan officer. Indeed, a high number of lender relationships of firms reduce the soft information production of the loan officer. The second variable of competition seems to behave in the same direction and is statistically significant. Indeed, a low concentration of lenders for firms, which represent a high level of competition, reduces the information production of the loan officer. Then, we investigated further the effect of the number of banking relationships on the soft information produced by the loan officer. First, we introduce variables to consider the years fixed effect and dummy variable to control for the specific loan officer effects. The regression results are reported in column 4 and do not change significantly. Also, we test different forms of the number of lending relationship variable.

A plausible assumption is that the number of creditor may not affect the soft information production linearly, so we first, add the log value of the number of banking relationships in column 5, and then we replace it by the square of the number of relationships in column 6. The results of these two regressions denote that coefficient on the log value of the number of banking relationships or the square of the number of relationships remain negative, strongly significant, but increases in magnitude compared to the coefficient in the prior regressions. Hence, this outcome suggests that loan officer's information production is non-linearly affected by the banking competition.

4-3 additional empirical checks

We conduct some additional empirical checks to extend the previous analysis. Indeed, we can assume that loan officer can be influenced by the credit score of firms when he evaluates the firm's quality using non financial criteria. So this fact supposes the existence of correlation between loan officer's evaluations under different assessment level of hard information, which may bias our results. So to overcome this empirical problem we assume that each one of the fifteen hard information rating level designed by different letter, from A+

(the best) to Z (the worst) as specific cluster, then we estimate our prior model by considering the cluster specific random effects, using Feasible GLS estimation (FGLS). The results are reported in table 4. A first insight of the outcome of the FGLS regressions shows that coefficient's signs and significant of economics determinants, firm characteristics, relationship variables and market structure variable remains consistent with the prior OLS results. However, results point out some difference regarding the coefficient significant of competition variables. The first column of the table IV indicate that both competition variables, the number of firm's creditors and bank financing share, influence the soft information production by the loan officer. Even the coefficient on Bank-Financing share variables is statistically significant at 10 % level; nevertheless, their coefficient impact information production is in the same direction, and confirms the previous results. For the two last regressions we test the robustness of the non-linearly effect of the number of banking relationships on the loan officer production of information about firm applicants for credit. Regression outcome yielded quite similar results as of OLS regression in column 5 of Table III, when we introduce the log value of the number of banking relationships as the competition variable in addition to bank financing share.

However, when we replace it by the square of the number of relationships in the last FGLS regression the two coefficients became statistically significant at 10% level.

Table IV – Determinants of loan officer's soft information production

The table reports the FGLS estimation results explaining the loan officer soft information production. The dependent variable is Loan officer's assessment of non financial firm's quality expressed on notes scaled from 0 (the worst) to 20 (the best). Standard errors are reported in parentheses.

VARIABLES	(7)	(8)	(9)
Economics variables			
Business Climate	-0.0357	-0.0214	-0.0357
	(0.0285)	(0.0292)	(0.0290)
Euribor	-0.264	-0.522	-0.188
	(0.383)	(0.565)	(0.443)
Firm characteristics			
Size	0.126***	0.113***	0.130***
	(0.0265)	(0.0294)	(0.0244)
Cash flow	0.183***	0.166***	0.180***
	(0.0460)	(0.0566)	(0.0460)
Firm age	-0.0305	-0.0494	-0.0191
	(0.123)	(0.145)	(0.118)
Balance Sheet age	-0.0374**	-0.0319***	-0.0377***
	(0.0146)	(0.0116)	(0.0145)
Relationship Variables			
Duration	0.163	0.0480	0.152
	(0.103)	(0.103)	(0.0982)
Distance	0.0326	0.123	0.0354
	(0.247)	(0.246)	(0.257)
Relationship Incomes Variables			
Arm's Length -NBI	-0.00388	0.000793	-0.00333
	(0.0120)	(0.0110)	(0.0119)
Saving -NBI	0.0797***	0.0775***	0.0802***
	(0.0264)	(0.0255)	(0.0252)
MLT-Credit -NBI	0.00800	0.00578	0.00990
	(0.0143)	(0.0167)	(0.0138)
ST-Credit -NBI	-0.0428	-0.0484	-0.0649**
	(0.0313)	(0.0310)	(0.0310)
Market structure variable			
Market share	-40.23**	-52.37*	-36.54
	(20.49)	(30.36)	(23.07)
Competition Variables			
Bank-Financing share	**0.00531***	**0.00816*****	**0.00480***
	(0.00293)	**(0.00281)**	**(0.00253)**
NBANKS	**-0.0999****		**-0.247***
	(0.0506)		**(0.147)**
Log-NBANKS		**-0.455*****	
		(0.112)	
NBANKS squared			**0.0204**
			(0.0172)
Industry FE	yes	yes	yes
Constant	34.82***	39.29**	33.33***
	(11.49)	(16.00)	(12.57)
Observations	860	754	860
Number of cluster	9	9	9

*** Significant at 1% level ; ** Significant at 5% level ; * Significant at 10% level

Conclusion

Based on recent Heider and Inderst (2012) theoretical analysis and their devised multi-task loan officer model, we investigate whether banking competition affects the loan officer production of information. We employ a unique data set retrieved from one of the three major French banks. We matched credit file information, firm specific characteristics, loan officer qualitative assessment, internal credit scoring outcome and the whole of lender-Firm relationships income framework beyond the traditional bank-firm relationships variables. For the competition variable we follow Hannan (1997) and Ongena et al. (2012) by decomposing the HHI into two terms, the number of banks from which firms borrow and the bank financing share of the loan officer's bank of the firm applicant for loan.

Considering the conceptual framework devised by Berger and Udell (2006) we build our analysis by using only relationships technology. Our paper arrives at two distinct empirical findings:

- The whole of lender-Firm relationship framework are important in loan officer production of information. In our case the amount of bank revenues from the saving relationship activities with firm increases the loan officer's evaluation of firm's quality.
- The two proxies of the two terms of the HHI index decomposition, the number of lender relationships and the bank financing share affect the loan officer information production by reducing the value of soft information produced by him.

Finally, the different outcomes of our empirical estimation show that competition increases the loan officer reliance to hard information to the detriment of soft information.

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Annex 1 **Summary statistics**

Category	Variable	Definition	N	Mean	Median	Std.dev	Min	Max
Information form								
	Soft information	Loan officer's assessment of non financial firm's quality expressed on notes scaled from 0 (the worst) to 20 (the best)	2154	14,84	15,15	2,44	0,82	19,39
	Hard information 1	An internal credit scoring based on audited financial statements, scaled from 1 (the worst) to 20 (the best)	2154	11,06	11,38	4,10	0	20
Economics variables								
	Euribor	The monthly Euribor 3-month average corresponding to the date of loan officer assessment	2154	1,14	0,99	0,54	0,643	5,12
	Business Climate	French monthly business sentiments index regarding different business sectors prepared by the French central bank.	2154	96,13	96,58	8,15	65,51	140,71
Firm characteristics								
	Size	The log value of the last year firm's turnover	2032	6,38	7,02	2,85	-6,91	10,81
	Cash flow	The log value of the firm's expected cash-flow	1566	4,49	4,65	2,05	-4,6	13,06
	Firm age	The log value of the firm's age in years	2122	2,37	2,5	1,01	-2,24	4,72
	Balance Sheet age	The duration between the loan officer assessment dates and the date on which the accounts were closed for the audited financial statements available for loan officer	2154	9,58	9	4,67	0	37
Firms industry								
	Trade (= 0,1)	Equals one if firm is operating in commerce sector and zero otherwise.	2148	0,19	0	0,39	0	1
	Industries (= 0,1)	Equals one if firm is operating in industrial sector and zero otherwise.	2148	0,13	0	0,34	0	1
	Services (= 0,1)	Equals one if firm is operating in services sector and zero otherwise.	2148	0,56	1	0,49	0	1
	Construction (= 0,1)	Equals one if firm is operating in construction sector and zero otherwise	2148	0,07	0	0,26	0	1
	AAI (= 0,1)	Equals one if firm is operating in Agriculture or Agri-Food Industry and zero otherwise.	2148	0,04	0	0,19	0	1
Relationship								
	Duration	The log value of the relationship's duration between bank and firm in years.	2047	1,78	1,78	0,95	-4,49	3,94
	Distance (= 0,1)	Equals one if the headquarters of the firm is in the same location of the loan officer's branch of the bank and zero otherwise.	2122	0,3	0	0,46	0	1
Relationship's Incomes Variables								
	Net Banking Incomes (NBI)	The total amount in Euro (in thousands) of the whole relationships earnings for the bank during the last 12 months.	1311	4,56	1,96	9,86	-2,77	143,41
	Credit -NBI	The bank's revenue amount in Euro (in thousands) from the credit activities with firm during the last 12 months.	1311	1,18	0	4,4	0	142,56
	Off- Credit -NBI	The bank's revenue amount in Euro (in thousands) from off-credit relationship with firm during the last12 months.	1311	3,38	1,25	8,7	0	142,56
	MLT-Credit -NBI	The bank's revenue amount in Euro (in thousands) from medium and long term's credit activities with firm during the last 12 months.	1311	0,83	0	3,48	-2,82	54,97
	ST-Credit -NBI	The bank's revenue amount in Euro (in thousands) from short term's credit activities with firm during the last 12 months.	1311	0,34	0	2,69	-0,02	61,21
	Saving -NBI	The bank's revenue amount in Euro (in thousands) from the saving relationship activities with firm during the last12 months	1311	0,77	0,141	5,23	0	142,56
	Arm's Length -NBI	The bank's revenue amount in Euro (in thousands) from arm's length services sale to SME during the last 12 months	1311	2,6	0,885	6,69	0	105,39
Market structure variable								
	Bank's Market share	The bank's market share of corporate loans in the geographical location of the firm's applicant for credit at the date of loan officer's evaluation.	2154	0,43	0,43	0,01	0,42	0,48
Competition Variables								
	NBANKS	The number of bank relationships	2154	2,29	2	2,13	0	14
	Bank-Financing share	The loan officer's bank financing share of the firm applicant for loan indebtedness.	2154	26,70	15,21	31,30	0	100