The Economic Effects of Sharing Credit Information on Credit Access an Empirical Investigation from 1997 to 2015

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Abstract

The process of decision making when granting credit, depends on reliable information on the creditworthiness and risk structure of potential borrowers. This information is typically gathered by credit bureaus. This paper explores the role and impact of credit information sharing among lenders in the credit market. In doing so, We study the effect of credit information sharing on access to credit using a rich dataset for 30 countries for the period 1997 to 2015. The empirical analysis shows that credit information sharing improves access to credit. The effect is statistically and economically significant.

Keywords: Sharing credit information, Credit Bureaus, Credit access, Fixed effect

Introduction

The lack of access to credit is due in large part by the availability of reliable and timely information on the financial situation of borrowers and their indebtedness level. In this respect, to meet the increase in demand for credit, it has become necessary for any lender and in our case financial institutions to work on the basis of real data on the way in which borrowers repay their loans, and, to transfer this information to other lenders in order to help them make the right decision for access to credit and to allow better allocation of funds. Stiglitz and Weiss (1981)[1] suggest that the need of complete information on borrowers tends to an inefficient allocation of credit, so lenders can improve their knowledge of borrowers through their observation of clients over time.

Sharing credit information is among the most effective ways that respond to this issue. Creditors consider information held as an important factor when evaluating the creditworthiness of the persons concerned and evaluate the conditions of consumer's credit.

These flows of information enable markets to operate more efficiently and at a lower cost that would be possible. In his article "What's in the File? », the economist Robert M. Hunt explains the importance of credit reporting. He writes: "Armed with more information, lenders can better evaluate potential borrowers and offer loan terms commensurate with their risk of default. And if future access to credit is a valuable option to a borrower, he or she will have an incentive to avoid a default that might become known to other creditors".[2]

The purpose of this paper is to identify the impact of credit information sharing on access to credit using data from 1997 to 2015 for 30 countries. The rest of this paper is organized as

[1] Stiglitz, Joseph E., and Andrew Weiss "Credit Rationing in Markets with Imperfect Information", American Economic Review 71, 1981, PP 393-410.

[2] Kate Gibson (August 2001). Cited by: Mark FURLETTI (June 2002) "An Overview and History of Credit Reporting", The Payment Cards Center of the Federal Reserve Bank of Philadelphia, P3

follows. The next section discusses how sharing credit information works. Then, we expose the literature review in this field. In section 3, we describe our data, discuss our empirical results .

1. How to Share Credit Information?

Sharing information on credit also called *Credit Reporting System*[1] can be mitigated through two institutions: private credit bureaus (PCBs)[2], and public credit registers (PCRs). The major difference between the two is that private credit bureaus derive their information from the voluntary contributions of the MFIs.
Its prior objective is to improve disclosure and accessibility of information for lenders by facilitating decision-making. The public credit registries another side, collect and track data that financial institutions are required to provide. The ultimate goal is to strengthen the regulation and banking supervision[3] and to improve the quality of credit portfolios.

These credit reporting systems (PCBs /PCRs) should possess credit information on every borrower. In a matured regulatory system they can verify and share borrower's credit history and thus will enhance capacities of risk taking. They also facilitate the development of various products to suite various classes of borrowers (The World Bank 2009).[4]These institutions don't take a decision whether to grant or reduce the credit request. It focuses primarily on providing factual evidence regarding credit lenders, to integrate into their credit evaluation process by the rules and policies of the lenders.

The information provided by the credit bureaus can be used only in the context of loan or credit management. This information may not, under any circumstances, be used for other purposes, including business development or marketing. Two types of data are distinguished: "negative" or "black" data which learn about the history of defaults and arrears of a borrower and "positive" or "white" data that provide detailed reports on the assets and borrower repayment capacity, its guarantees and statistics of refund. Positive reporting is based on the assumption that the analyses of today's indebtedness indicate tomorrow's solvability, whereas negative reporting considers that defaults and difficulties are the most relevant indicators with which to predict future insolvency.[5]

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[1]Several titles are destined to the system of sharing credit information and more often "credit Bureaus" or "credit registries". For private systems, they are usually called "private credit registries or private credit bureaus ", while for public systems, they are often called "Centrale des risques or public credit bureaus or registries". They are defined as a "Process where bank and other credit providers submit information about their borrowers to a credit reference bureau so that can be shared with other credit providers. It enables the bank to know how borrowers repay their loans" Fina Bank. It is also defined as "…the broader institutional framework for credit reporting in an economy including existing public and private credit registries, collateral registries, judicial records, etc., and the legal and regulatory framework for credit reporting, privacy and consumer protection" (WHCRI (2005)).

[2]A private credit bureau is defined as "A private firm or nonprofit organization that maintains a database on the creditworthiness of borrowers (persons or businesses) in the financial system and facilitates the exchange of credit information among banks and financial institutions. Credit investigative bureaus and credit reporting firms that do not directly facilitate information exchange between financial institutions are not considered". (Doing Business)

[3]According to survey data collected by the World Bank from 34 central banks over the period 1999 to 2001, information's PCRs are used primarily in banking supervision, mainly to determine the total debt of borrowers in the system overall. The PCR data also allows supervisors to review and correct if necessary, the classification given to borrowers by their financial institutions. In Addition, They assess the inadequacy of the provisions for doubtful debts, in order to identify the causes that expose their credit risk.

[4]Basirat A. Ayalowo, Housing Market Constraints in the West African Region, Mediterranean Journal of Social Sciences Vol. 3 (11), November 2012), PP 241-252.

[5] Amparo San José Riestra, Credit Bureaus in Today's Credit Markets, Ecri Research Report No. 4, European Credit Research Institute, September 2002, P7.

2. Role of Credit Information Sharing in Credit Market: Literature Review

The exchange of financial data and devices of sharing customer's information in the credit market has been the subject of a large body of economic literature[1].
Transparency and credit information sharing are an integral part of the financial system. So, a good quality of information disclosure can reduce the asymmetric information between stakeholders. This idea came from the works of Pagano and Jappelli (1993), Padilla and Pagano (1997), Padilla and Pagano (2000), Jappelli and Pagano (2002), Brown et al (2009).

An argument highlighted in a report of the Inter-American development Bank (2005)[2] on the crucial role played by sharing information between lenders in the credit market: "If a borrower does not repay his bank and other banks do not know about it, the faulty client can go to any other bank and ask for a loan, and his cost of defaulting on his loan obligations is relatively low. If other banks know about his behavior, however, then it will be more difficult to access credit once he has defaulted. Information sharing among lenders makes a borrower's default costs higher". (P175)

Moreover, information sharing plays an important role in the reduction of the financial crisis. Büyükkarabacak and Valev (2012)[3] in their empirical study have put in relation credit information sharing with the occurrence of banking crises in 98 countries over the period 1975 to 2006.The results show that credit information sharing reduces the likelihood of banking crises. Also, they showed that it reduced the negative impact of rapid credit growth on banking crises.

Galindo and Miller (2001)[4] analyze the degree on which credit reporting reduce credit rationing, indicating that companies have fewer credit constraints when credit reports are available. Using new data from 42 African countries, Gajigo and Triki (2012)[5] find out the effects of public and private credit registries on access to finance, as well as the effect of creating credit registries public on the severity of financing constraints. It follows that access to finance has the highest average in countries with private credit bureaus compared to countries with public credit registries or others, having no institution.

Moreover, Love and Mylenko (2003)[6] analyze a sample of 5000 companies from 51 countries countries and conclude that the introduction of private credit registry weakens financial constraints reported by SMEs decreasing from 49% to 27%. The same paper confirms that the probability of getting credit by SMEs rose from 28 to 40%. For example, in Ecuador, the number of loans offered to micro-entrepreneurs increased from 60,000 to 719,000 representing 1,098 per cent, between 2002 and 2007.

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[1]Federico Ferretti, Consumer Credit Information Systems: A Critical Review of the Literature. Too little attention paid by Lawyers?, European Journal of Law and Economics, Vol. 23, 1, February 2007, PP 71-88.
[2] Inter-American Development Bank, Unlocking Credit: The Quest for Deep and Stable Bank Lending, Washington DC, Inter-American Development Bank. 2005.
[3]Berrak Büyükkarabacak and Neven Valev, Credit information sharing and banking crises: An empirical investigation?, United States, Journal of Macroeconomics Vol 34, issue 3, March 2012, PP 788–800
[4]Galindo, Arturo and Margaret Miller, Can Credit Registries Reduce Credit Constraints? Empirical Evidence on the Role of Credit Registries in Firm Investment Decisions, unpublished, 2001.
[5]Thouraya Triki And Ousman Gajigo, Credit Bureaus and Registries and Access to Finance: New Evidence from from 42 African Countries Working Paper No. 154, African Development Bank Group, October 2012.
[6] Love, I. and N. Mylenko, Credit reporting and financing constraints, Working Paper, World Bank, Washington: DC, 2003.

As well, information sharing has an important role in reducing information asymmetries and allows lenders to more accurately assess credit risks and thus improve the quality of their portfolios. According to Pagano and Jappelli (1993)[1], (Padilla and Pagano, 2000)[2], sharing information serves at improving the selection of borrowers and reduces moral hazard by increasing the effort of borrowers to repay their loans. It derives from this climate of exchange lower default rates.

In this sense, the increase in loans to good payers would be offset by a decrease in loans to bad borrowers. In this framework, based on an empirical test on the effect of credit bureau, Luoto, McIntosh and Wydick (2007)[3] confirm in Guatemala the positive role of information sharing in improving the performance of credit and reducing in late monthly payments of borrowers, falling between 2% to 3.5% after the introduction of credit bureau comparing with the preceding period. By testing a positive relationship between information sharing and access to credit in 43 countries, Jappelli and Pagano (2002)[4] prove that credit market is more efficient in countries where information dissemination is well established. Besides, in these countries, a lower default rate and interest rates were noticed. Turner et al. (2008)[5] provide similar results on the lower rate of losses and the interest rate.

When information on borrowers is shared, improving the performance of the credit portfolio is established via the ability to screen the good borrowers from bad ones. This allows lenders to grant loan sat lower interest rate for low-risk borrowers. Bennardo et al. (2008)[6] argue that information sharing reduces the risk of over- indebtedness, as individual lenders can access to information on the overall indebtedness of borrowers of all loans sources. It is also argued that sharing information increase loan performance by improving screening borrowers (Bennardo et al. 2010)[7].

On a similar vein, Brown and Zehender (2007)[8] show empirically that the introduction of credit registries (private/public) encourages borrowers to pay their debts by allowing lenders to identify good borrowers have a good history.

Moreover, Brown and Al (2009)[9] find that information sharing is associated with lower cost of credit in transition countries in Eastern Europe, and it drives from better access to credit. In Eastern Europe, leverage ratios are 4.2 percentage points higher in those countries where

[1] Pagano, M., Jappelli, T, Information sharing in credit markets, The Journal of Finance 43 (5), 1993, PP 1693–1718. They conclude that borrowers have a greater incentive to do if lenders change only negative information, knowing that the sharing of positive characteristics of the borrower can mitigate the negative impact of delinquencies and mitigate the disciplinary effect of credit bureau.

[2] Padilla, A, Pagano, M, Sharing default information as a borrower discipline device, European Economic Review 44, 2000, PP 1951–1980.

[3] Luoto, Jill, Craig McIntosh, and Bruce Wydick "Credit Information Systems in Less Developed Countries: A Test with Microfinance in Guatemala." Economic Development and Cultural Change 55(2), 2007, PP 331-34.

[4] Jappelli, T., Pagano, M, Information sharing, lending and defaults: cross-country evidence. Journal of Banking and Finance 26, 2002, PP 2017–2045.

[5]Michael A. Turner, Robin Varghese, Patrick Walker, The Structure of Information Sharing and Credit Access: Lessons for Policy. A PERC Briefing Paper sponsored by the Asia-Pacific Credit Coalition, July 2008.

[6] Bennardo, A., Pagano, M., Piccolo, S, Multiple-bank Lending, Creditor Rights, and Information Sharing. CSEF WP WP No. 211, 2008.

[7] Bennardo, Alberto, Marco Pagano, and Salvatore Piccolo, Multiple-bank lending, creditor rights and information sharing, Working Paper 211, Centre for Studies in Economics and Finance, Salerno, 2010

[8] Brown, M., Zehender, C. Information sharing and credit rationing: evidence from the introduction of a public credit registry. Journal of Money, Credit, and Banking 39 (8), 2007, PP 1883–1918.

[9] Brown, M., Jappelli, T., Pagano, M, Information sharing and credit: firm level evidence from transition countries. Journal of Financial Intermediation 18, 2009, PP 151–172.

credit information sharing is more developed.[1]Another study conducted by Barron and Staten (2003)[2] illustrate how lenders could significantly reduce their default rate by including more detailed information about the borrower in their default prediction models and facilitate access to credit. Jappelli and Pagano (2001) find that the performance of credit registers represented by the number of years of operation and the type of information they share (positive[3], negative, or both) has a significant negative effect on non-performing loans.

The World Bank (2006) executes a research in Argentina and Brazil, showing that the exchanging of both negative and positive information leads to reduce default rate in Argentina by 22%, and 45% in Brazil. Comparing to situations where lenders share only negative information.

A joint investigation between Inter-American Development Bank and the World Bank in 2002, covering banks in Latin America that lend primarily to consumers and SMEs, concluded that using the mechanisms of information sharing has decreased default rate in their portfolios, compared to banks that do not use sharing information.[4]
Studies of McIntosh and Wydick (2004[5], 2005[6]) show that the presence of the credit bureaus improves access to credit to poor borrowers. They assume that in a competitive market, information sharing reduces the costs incurred by lenders through a low default rate.[7] In this extend, Djankov et al. (2007)[8] show that these institutions (PCRs, PCBs), are related to a high high ratio of private credit to gross domestic product. Specifically, after the introduction of credit registry (private / public), the ratio of private credit -to-GDP increased by 7-8 percentage points over the next five years. Berger, Frame and Miller (2005)[9] show how these institutions increase the amount of loans granted to small firms in the United States. Similarly, Singh et al (2009)[10] show in sub-Saharan countries that encourage the exchange of credit information report higher levels of private credit as a share of GDP.

Since borrowers are aware that their credit history will be known by the MFIs, so they will be encouraged to respect their commitments keeping access to credit in the future.Vercammen

[1]Tobias BAER, Massimo CARASSINU, Andrea Del MIGLIO, Claudio FABIANI and Edoardo GINEVRA, The The national credit bureau: A key enabler of financial, McKINSEY Working paper on Risk, N° 14, December 2009, P4

[2] Barron, J. M., and M. Staten (2003), The Value of Comprehensive Credit Reports: Lessons from the U.S. Experience, in M.J. Miller (ed.), Credit Reporting Systems and the International Economy, Boston: MIT Press.

[3]A study by the World Bank on the basis of information from Argentina, found that even large banks may experience a significant decline in defaults when positive information is included in credit reports.

[4]Robert Kirchner, Ricardo Giucci § Vitaliy Kravchuk, Improving the Framework of Credit Bureaus' Operations: Operations: Key Recommendation, Policy Paper Series, German Advisory Group, Institute for Economic Research and Policy Consulting, April 2012, P5

[5] McIntosh, Craig and Bruce Wydick, A Decomposition of Incentive and Screening Effects in Credit Market Information Systems. Working Paper, University of California at San Diego/University of San Francisco, 2004

[6] McIntosh, Craig and Bruce Wydick, Competition and Microfinance, Journal of Development Economics 78, 2005, PP 271-98.

[7]This implies that in zero-profit equilibrium, borrowers with lower initial assets are added to the portfolio of micro-lender (Luoto et al 2007).

[8] Djankov, S., McLiesh. C, Shleifer, A, Private credit in 129 countries. Journal of Financial Economics 84, 2007, 2007, PP 299–329.

[9] Berger, Allen, Scott Frame, and Nathan Miller, Credit Scoring and the Availability, Price and Risk of Small Business Credit, Journal of Money, Credit, and Banking, 2005, PP 191-222.

[10] Raju Jan Singh, Kangni Kpodar, and Dhaneshwar Ghura « Financial Deepening in the CFA Franc Zone: The Role of Institutions », International Monetary Fund, May 2009, WP/09/113.

(1995)[1] and Klein (1992)[2] in their theoretical models point out about the advantage of this issue. So, Borrowers are more likely to repay their debts as their information's default has become available for all lenders. A study by the World Bank in 2010 shows that half of the borrowers are likely to repay their loans if they knew that their payments will be reported to credit bureaus.

This idea is supported even by Padilla and Pagano (1997)[3] which accentuate the disciplinary effect of exchanging information between lenders on the behavior of borrowers in perfect competition. Credit bureau sallow borrowers to have good reputations collateral and offers the opportunity to negotiate the terms of credit.[4]

Doblas-Madrid and Minetti (2009), note that if lenders adhere in a sharing information institution, clients can improve the performance of their refund. In the same vision, Janvry et al (2010)[5] show that the introduction of a credit bureau translates an improvement in performance repayment of new individual customers and an increase in loan size group.[6]

McIntosh and al (2006)[7] show that before the implementation of a credit bureau, the proportion of non-performing loans for individual and group loans was moderately stable. While after the credit bureau has begun to be used by financing agents in the selection of new customers, the average percentage of payment delays in individual loans decreased from 67.2% of loans pre-credit bureau to 52.8% of the loans-post credit bureau.[8]Behr and Sonnekalb (2012)[9]use the introduction of a public credit registry by the Albanian central bank bank in January 2008 to analyze the effect of information sharing between lenders on non-performing loan. They find that sharing information improves loan performance by reducing the likelihood that borrowers will have in arrears on their loans.
In transition countries, the quality of lending has also strongly improved, with the ratio of non-performing loans in banks' portfolios falling from more than 20% in 1999 to just 10% at the end of 2004.[10]

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[1] Vercammen, James A, Credit bureau policy and sustainable reputation effects in credit markets, Economica, 62, 1995, PP 461-78.
[2] Klein, D, Promise keeping in the great society: a model of credit information sharing. Economics and Politics 4, 1992, PP 117–136.
[3] Padilla, A., Pagano, M., Endogenous communication among lenders and entrepreneurial incentives, Review of Financial Studies 10 (1), 1997. PP 205–236.
[4] Nataliya Mylenko, Developing Credit Reporting in Africa : Opportunities and Challenges, IFC, The World Bank Group, Issue N° 19, September 2007.
[5] De Janvry, Alain, Elisabeth Sadoulet, and Craig McIntosh.. "From Private to Public Reputation in Microfinance Lending: An Experiment in Borrower Response." University of California at Berkeley and San Diego, 2006. http://are.berkeley.edu/~sadoulet/papers/CreditBureau16.pdf.
[6]In addition, many customers who pay their bad loans are rejected by the result of the establishment of credit bureaus.
[7] McIntosh, Craig, Elisabeth Sadoulet, and Alain de Janvry, Better Lending and Better Clients: Credit Bureau Impact on Microfinance, BASIS Brief No. 45. Madison, Wisc. Department of Agricultural and Applied Economics, University of Wisconsin, Madison, May 2006.
[8]In addition arrears in individual loans pursue to decrease for about two years, suggesting the authors that the use use of credit bureau continues to ameliorate the performance of funds. For two months after entry ,the proportion of default loans is expected to be reduced by0.9percentmore.
[9]Behr P, Sonnekalb. S, The effect of information sharing between lenders on access to credit, cost of credit, and loan performance - evidence from a credit registry introduction, Journal of Banking & Finance, Nov 2012, Volume: 36 Issue: 11, PP 3017-3032
[10] Martin Brown, Tullio Jappelli And Marco Pagano «Information sharing and credit: Firm-level evidence from transition countries», Journal of Financial Intermediation, Volume 18, Issue 2, April 2009, P152

3. Empirical Analysis

3. 1. Motivation and Description of Variables

To better capture the effect of information sharing on access to credit, we add four macroeconomic and financial variables. These variables are selected in the light of the theoretical considerations. Data are collected from various sources. Table 1 summarizes the variable definitions and data sources.

3.1.1. Variable of Credit Information Sharing

Lenders grant more credit if they have good information on borrowers. To take account of the different levels of information sharing, we use the same index of the quality of information on credit *" Credit Depth information index"* used by Büyükkarabacak and Valev (2012), Sorge and Zhang (2010), and developed by the World Bank Doing Business. This index measures the presence and structure of public or/ and private credit bureau. The index valuesare between 0and 6.The value 6indicates that more information is shared, and thus the extension of credit will be easier by consulting a PCB or PCR. If the PCB or PCR is not operational or if the coverage of the adult population is less than0.1, a score of 0 is assigned to the index. Then, an additional point is added for each of the following, if such information is included:

- Both positive and negative information.
- Data on households and firms.
- Data from retailers and utility companies as well as financial institutions.
- More than two years of data.
- Data on loans below 1% of income per capita.
- Access borrowers to their data.

This index is used by Brown, Jappelli and Pagano (2009) but they don't take into account the sixth item on the rights of borrowers. The index was scaled from 1 to 5.

3.1.2. Control Variables

Our choice of control variables follows the standard practice in the literature on access to credit.

We control the credit interest rate based on the theory of microfinance, which suggests that a high rate of interest rate reduce[1] the probability of access to credit for poor borrowers on projects whose profitability is below the practical interest rate[2].Thus, we introduce the inflation rate to control each country's macroeconomic stability. Boyd, Levine, and Smith (2001) show that countries with high and volatile[3] inflation, have an underdeveloped financial financial system[4], and therefore face difficulties in credit supply. Huybens and Smith (1999)

[1]High interest rates encourage savings, but at the same time serve as a barrier to access to credit for businesses that are not able to borrow at these rates. However, lower interest rates may be useful for small borrowers who do not know much investment opportunities at high-yield (Collins and Wanjau 2011)

[2]The rate of interest charged by MFIs is usually placed between the rate of the banking system and the rate of the the informal market.

[3]In these circumstances, lenders are predisposed to offer credits to variable and discriminatory rates to guard against the risk of interest rate (Ayalowo 2012). However, in a more stable monetary environment they face less financing constraints.

[4] Thorsten BECK, Asl DEMIRGÜÇ-KUNT and Ross LEVINE (January 2004) *Law and Firms' Access to Finance,* World Bank Policy Research Working Paper 3194, P15

argue that inflation exacerbates information asymmetries[1]and thus reduced access to credit. We also monitor the growth of GDP[2], as a rapid expansion of the economy may require more credit. We also include the rule of law to monitor the effectiveness of the legal rights rules system, as it is used in the models of LaPorta et al (1998), Laeven and Majnoni (2003), Thomas and Gajigo (2012) and others. Chavis et al (2010) note the existence of a real effect of access to credit constraints in countries with the weak rule of law.

This variable is an index that ranges from -2.5 to +2.5. Most legal systems are in place, the greater the value of this index tends to 2.5.

Table 1: Definitions of the variables and data sources

Variable	Definition	Source	Data period
GDP Growth	Average annual growth of real gross domestic product in percentage	World Bank(World Development Indicators)	1997- 2015
Real Interest Rate	Nominal interest rate minus the inflation rate	World Bank(World Development Indicators), Central banks	1997- 2015
Inflation rate	Pourcentage de variation du déflateur du PIB	World Bank (World Development Indicators), Research of author	1997- 2015
The rule of law	An indicator of the extent to which the country adheres To the rule of law. ranging from-2.5(low) to+2.5 (strong)	Worldwide Governance Indicators (WGI)	1997- 2015
Credit depth of information index	Measurement of the rules and practices affecting the coverage, scope and accessibility of credit information available through the public or private credit bureau. Ranging from 0 to 6	World Bank(Data of Doing business)	1997- 2015
Domestic credit to private sector (% of GDP)	The financial resources allocated to private sector relative to GDP	World Bank (World Development Indicators)	1997- 2015

3.2. Sample, Estimation Method and Analysis of Results

3.2.1. Sample

The sample includes 30 countries (Algeria, Argentina, Armenia, Belarus, Bolivia, Brazil, Bulgaria, China, Colombia, Croatia, Estonia, Guatemala, Hungary, Indonesia, Latvia, Lebanon, Macedonia, Mexico, Moldova, Namibia, Pakistan, Panama, Peru, Roumania, Russia, South Africa, Thailand, Uganda, Ukraine, Uruguay), over the period 1997-2015 (total of 570 observations). The choice of countries and the period is the result of a process of maximizing in space and time of the observations for a balanced sample of 19 × 30.It is composed of 19 countries have either PCR or PCB, which represents 63.33% of the sample, and 11 countries have both systems representing 36.66% of the sample.

[1] Luc LAEVEN and Giovanni MAJNONI (October 2003) "*Does judicial efficiency lower the cost of credit?"*, World Bank Policy Research Working Paper No. 3159*,* P10

[2]When GDP is growing, banks have confidence in the payment status of borrowers and thus facilitate the dissemination of credit.

It should be noted that the number of private credit bureaus (PCBs) are more important in the world than the public credit registries (PCRs). In this work, we assume that these two systems have the same effect on the credit market for two reasons. First, it is to detect the impact of the sharing of credit information in a general way through these two mechanisms without having to specify which is the most relevant based on the work of Jappelli and Pagano (2002) who argue that public and private bureaus are substitutes offering the similar benefits to the financial system. These same results are confirmed by Büyükkarabacak and Valev (2012). Secondly, we do not seek to discover the relative impact of PCB or PCR on the credit market.

3.2.2. Estimation Method

After a broad brush of empirical studies, we examine the different variables that may influence the access to credit. This allows us to locate us on a fixed-effects panel data[1] model in order to realize this issue empirically. This method allows us to take into account the heterogeneity of countries that make up the sample assuming that equations that manage relations $X \rightarrow Y$ differ from country to other, by a simple constant element a_i. To simplify the model, we assume that there is no temporal effect. The regression equation is written as follows: k = 1..., 5 represent the number of explanatory variables, T: year of measurement, I: country index

$$DCP_i = i_T\, a_i + X_i\, \beta + \varepsilon_i$$

(19, 1) (19, 1) (19, 5) (5, 1) (19, 1)

DCP_i is a measure of Domestic credit to private sector (% of GDP) in the $i^{ème}$ country. i_T is a column vector $\begin{bmatrix}1\\1\\1\\\vdots\\1\end{bmatrix}$ of T×1→ 19×1 dimension

a_i: Indicates the unobservable specificity of the country supposedly fixed in time *(time invariant)*.It's a vector of real which differs from country to another. X_i is a vector of explanatory variables including the Real interest rate (RIR), Rule of law (RL), Inflation rate (INF), Credit Depth of Information index (CDI), GDP growth (GDP). It is a vector of T × K → 19 × 5dimension.

$$X_i = \begin{pmatrix} RIR_{1,1} & RL_{1,1} \cdots & GDP_{1,1} \\ RIR_{2,2} & RL_{2,2} \cdots & GDP_{2,2} \\ \vdots & \ddots & \vdots \\ RIR_{30,19} & RL_{30,19} \cdots & GDP_{30,19} \end{pmatrix}$$

β is a vector of coefficients of the independent variables $\begin{bmatrix}\beta_1\\\beta_2\\\vdots\\\beta_5\end{bmatrix}$ of K×1→ 5×1 dimension.

[1]The interest of a panel data is to analyze the dynamic behavior and capture the heterogeneity of individuals (Sevestre 2002).

ε_I error terms assumed to be identical with mean zero and to be uncorrelated both in the individual dimension or in the time dimension.

The parameters *a* and*β*of model are estimated using Ordinary Least Squares *(Least Square Dummy Variable)*.

3.3. Analysis and Interpretation of Results

Using multiple regression models, a necessary condition must be fulfilled concerning the absence of multicollinearity between independent variables (exogenous). Table 2 presents the correlation coefficients of Pearson of different exogenous variables making our model.

Table 2: Matrix of Pearson correlation

	RL	RIR	INF	GDP	CDI
RL	1.000000				
RIR	0.081680	1.000000			
INF	-0.075556	-0.427116	1.000000		
GDP	-0.074947	-0.124052	0.041021	1.000000	
CDI	0.142914	0.093946	-0.115074	0.035004	1.000000

Table 2 shows a weak correlation between the exogenous variables. These findings enable us to confirm the absence of multicollinearity problem and gather our variables in the same model. Table 3 presents the results of the regression.

Table 3: Estimation results

Estimation on panel data from 30 countries over the period 1997-2011 (450 comments), using the method of least square ordinary fixed-effects (LSDV). Dependent variable ***DCP*** (Domestic Credit provided to Private sector /GDP).***RIR*** (Real Interest Rate), ***RL*** (Rule of Law), ***INF*** (Inflation rate), ***CDI*** (Credit Depth of Information index), ***GDP*** (GDP growth).*P-value* in parentheses. (*), (*) and (**) Coefficients significant respectively at 1%, 5% and 10%.

Dependent Variable: DCP?		
Method: Pooled Least Squares		
Sample: 1997 2015		
Included observations: 19		
Cross-sections included: 30		
Total pool (balanced) observations: 570		
Variable	**Coefficient**	**Prob.**
C	31.93233	0.0000
INF***	-0.030192	0.0404
RIR**	0.014955	0.8298
RL	-1.612320	0.4616
GDP**	-0.918280	0.0000
CDI***	4.982976	0.0000

As it can be seen above, a positive and significant coefficient at 1% level of credit information index (CDI). This means that there is a positive relationship between sharing information on credit and access to credit measured by credit private to GDP (DCP). Table 3 shows that a 1% improvement in sharing credit information increases the ratio of credit private by 4.98%. These results confirm those obtained in most of the works and with

different methodologies (Thomas and Gajigo (2012), Singh et al. (2009), McIntosh and Wydick (2007), Djankov et al. (2007) and Pagano and Jappelli (2002)).

A positive and significant association at 5% level appears between the real interest rate (RIR) and private credit so that an increase of 1% in RIR appreciates the private credit at approximately 0.015%. And unlike existing hypothesis, which postulates a negative relationship between real interest rates and access to credit. Bennardo et al (2009) have based on the reflection that most customers borrow from several banks simultaneously. In such situation, banks may be willing to grant additional credit for those already in debt, charging them high-interest rates and expect to recover their money at the expense of other creditors in the event of default.

Similarly, in theoretical models of Vercammen (1995) and Padilla and Pagano (2000) it has shown that the presence of negative information sharing by credit bureaus is considered as a signal of poor quality borrowers who can be translate as a punishment imposing them a higher interest rate.

This positive relationship found in our model may be interpreted by a policy bank financing relationship. In other words, to reduce the difficulties of access to financing bank for the more opaque borrowers, banks extend credits by the establishment of a long-term customer relationship that lets them collect more information on their customers. And therefore, despite the interest rate is high, the level of credits allowed remains an increase. Another meaning can be attributed to this relationship. So, when lenders are less informed about the quality of their customers, the credit granting decision often depends on the ability of the borrower to provide more guarantees. As a result, when the borrower agrees to lend at a high rate by reporting more guarantees, the bank grant more credit since it is protected by the value of the guarantee in case of default.

Conclusion

The presence of credit information sharing systems is an important factor on the credit market offering a complete picture of an individual and presenting the solvency of the company. The availability of high-quality information in real time on the behavior of borrowers is an integral component ensuring access to credit. The beneficial effect of sharing information on credit between the financial institutions is confirmed by several empirical studies (Thomas and Gajigo (2012), Brown et al. (2009), Djankov et al. (2007), Jappelli and Pagano (2002)). In this paper, we have provided proof that the positive effect of this device is realized at the macro level where private or public bureaus are installed. Our empirical investigation in panel data shows that there is a positive and significant association between sharing information and the availability of credit. We reached a conclusion that a strengthening of 1% in credit information sharing improves the access to credit by 4.98%.

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