THE RELATIONSHIPS BETWEEN CREDIT INFORMATION SHARING, CREDIT ACCESS AND DEFAULTS PAYMENT: PANEL DATA FROM 30 COUNTRIES

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Abstract
The objective of this paper is to study the effect of credit information sharing on the access to credit and defaults payment. Using Panel data analysis over a rich dataset from 30 countries for the period 1997 to 2015, we come up with the following results that suggest that information sharing between lenders by means of private or public credit bureau facilitates credit access and reduces repayment loans problems Specifically, the process of sharing credit information improves access to credit by approximately 5%, and decreases the incidence of defaults by 1.5%.

Keywords: Sharing information, Credit bureaus, Credit access, Defaults

1. Introduction

The lack of credit access and problems of repayment are due partly to 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 and reduce defaults, 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 as far as access to credit is concerned and to allow better funds allocation. Stiglitz and Weiss (1981)[1] suggest

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

that the need for complete information on borrowers tends to an inefficient allocation of credit, to the extent that 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 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″.[1]

The purpose of this paper is to identify the impact of credit information sharing on access to credit and on defaults rate, using data from 1997 to 2015 for 30 countries.

The rest of this paper is organized as follows. The next section exposes the literature review of credit information sharing. Section 3 describes our empirical analysis. Section 5 discusses our empirical results and section 5 concludes.

2. Role of credit information sharing in credit market: Literature review

The exchange of financial data and devices of sharing customer's information in credit market has been the subject of a large body of economic literature[2]. 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)[3] 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*

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[1] 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
[2] 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.
[3] Inter-American Development Bank, Unlocking Credit: The Quest for Deep and Stable Bank Lending, Washington DC, Inter-American Development Bank. 2005.

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 financial crisis. Büyükkarabacak and Valev (2012)[1] 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. In addition, they showed that it reduces the negative impact of rapid credit growth on banking crises.

Galindo and Miller (2001)[2] analyze the degree on which credit reporting reduce credit rationing, indicating that companies have less credit constraints when credit reports are available. Using new data from 42 African countries, Gajigo and Triki (2012)[3] 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)[4] analyze a sample of 5000 companies from 51 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.

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)[5], (Padilla and Pagano, 2000)[6], sharing information serves at improving the selection of borrowers and reduces moral hazard by increasing the effort of borrowers to

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[1]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

[2]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.

[3]Thouraya Triki And Ousman Gajigo, Credit Bureaus and Registries and Access to Finance: New Evidence from 42 African Countries Working Paper No. 154, African Development Bank Group, October 2012.

[4] Love, I. and N. Mylenko, Credit reporting and financing constraints, Working Paper, World Bank, Washington: DC, 2003.

[5] 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 and mitigate the negative impact of delinquencies and mitigate the disciplinary effect of credit bureau.

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

repay their loans. It derives from this climate of exchange a 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)[1] 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 on 43 countries, Jappelli and Pagano (2002)[2] 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)[3] 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 loans at lower interest rate for low-risk borrowers. Bennardo et al. (2008)[4] argue that information sharing reduces risk of over- indebtedness, as individual lenders can access to information on the overall indebtedness of borrowers of all loans sources. It is argued also that sharing information increase loan performance by improving screening borrowers (Bennardo et al. 2010)[5].

On a similar vein, Brown and Zehender (2007)[6] show empirically that the introduction of credit registries (private/public) encourages borrowers to pay their debts by allowing lenders to identify good borrowers having a good history. Moreover, Brown and al (2009)[7] find that information sharing is associated with lower cost of credit in transition countries in Eastern Europe, and it drives from a better access to credit. In Eastern Europe leverage ratios are 4.2 percentage points higher in those countries where credit information sharing is more

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[1] 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.
[2] Jappelli, T., Pagano, M, Information sharing, lending and defaults: cross-country evidence. Journal of Banking and Finance 26, 2002, PP 2017–2045.
[3] 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.
[4] Bennardo, A., Pagano, M., Piccolo, S, Multiple-bank Lending, Creditor Rights, and Information Sharing. CSEF WP No. 211, 2008.
[5] 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
[6] 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.
[7] 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.

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 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-

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[1]Tobias BAER, Massimo CARASSINU, Andrea Del MIGLIO, Claudio FABIANI and Edoardo GINEVRA, 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: 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, 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, PP 299–329.

8 percentage points over the next 5 years. Berger, Frame and Miller (2005)[1] show how these institutions increase the amount of loans granted to small firms in the United States. Similarly, Singh et al (2009)[2] show in sub-Saharan countries that encourage the exchange of credit information report higher levels of private credit as 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 (1995)[3] and Klein (1992)[4] in their theoretical models point 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 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)[5] which accentuate the disciplinary effect of exchanging information between lenders on the behavior of borrowers in perfect competition. Credit bureaus allow borrowers to have a good reputation as collateral and offer the opportunity to negotiate the terms of credit.[6]

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)[7] 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.[8]

McIntosh and al (2006)[9] show that before the implementation of credit bureau, the 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

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[1] 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.

[2] 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.

[3] Vercammen, James A, Credit bureau policy and sustainable reputation effects in credit markets, Economica, Economica, 62, 1995, PP 461-78.

[4] Klein, D, Promise keeping in the great society: a model of credit information sharing. Economics and Politics 4, 1992, PP 117–136.

[5] Padilla, A., Pagano, M., Endogenous communication among lenders and entrepreneurial incentives, Review Review of Financial Studies 10 (1), 1997. PP 205–236.

[6] Nataliya Mylenko, Developing Credit Reporting in Africa : Opportunities and Challenges, IFC, The World Bank Group, Issue N° 19, September 2007.

[7] 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.

[8] In addition, many customers who pay their bad loans are rejected by the result of the establishment of credit bureaus.

[9] McIntosh, Craig, Elisabeth Sadoulet, and Alain de Janvry, Better Lending and Better Clients: Credit Bureau Bureau Impact on Microfinance, BASIS Brief No. 45. Madison, Wisc. Department of Agricultural and Applied Economics, University of Wisconsin, Madison, May 2006.

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 loans-post credit bureau.[1]Behr and Sonnekalb (2012)[2]use the introduction of a public credit registry by the Albanian central bank in January 2008 to analyze the effect of information sharing between lenders on non-performing loan. They find that sharing information improve 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.[3]

3. Empirical analysis

3. 1. Hypotheses and the data set

3.1.1. Formulation of hypotheses

Before presenting the methodology adopted in our empirical study, we propose, first, to formulate a number of hypotheses derived from the theoretical and empirical literature and we seek to validate throughout this research.

First, sharing information on the creditworthiness of borrowers plays a major role in the volume of loans granted. Brown et al (2009) conduct a study based on panel data on countries in transition in Eastern Europe, they find that sharing of credit information is associated with a low cost of credit, and leads to a better access to credit. Djankov et al (2007) show that the presence of private or public credit bureaus is related to a high ratio of private credit to GDP.

In light of the previous arguments and knowing that the index of credit information sharing includes information from other sources, we propose the following hypothesis:

H_1: The devices Institutional of sharing credit information tend to have a positive effect on access to credit.

Second, Jappelli and Pagano (2001) find that the performance of the credit bureaus represented by the number of years of operation and the type of information they share, have a negative and significant effect on non-performing loans. Promoting the exchange of credit information among lenders, credit bureaus reduce the indebtedness of borrowers (Padilla and Pagano (2000), Brown and Zehnder (2005)). Such effects of credit bureaus are likely to be beneficial to

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[1]In addition, arrears in individual loans pursue to decrease for about two years, suggesting the authors that the the 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 by 0.9 percent more.

[2]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

[3] 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

borrowers who will be encouraged to make more efforts to complete their projects and repay their loans. From this point, we search to know whether these mechanisms have the same impact on defaults in our sample, our hypothesis is advanced as follows:

H_2: *The existence of sharing credit information systems is likely to reduce defaults.*

3.1.2. Motivation and description of variables

3.1.2. 1. Dependent variable

a. Model 1: Access to credit

In this model, the dependent variable (access to credit) is measured by the amount of credit involved in the private sector relative to the size of the economy. Specifically, it measured by domestic credit to private sector refers to financial resources provided to the private sector, such as loans, purchases of non equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.[1]

b. Model 2: Defaults

In this model, we measure defaults by the ratio of non-performing bank loans relative to total gross loans. This ratio corresponds to the value of nonperforming loans divided by the total value of the loan portfolio (including nonperforming loans before the deduction of provisions for loan losses).

3.1.2. 2. Independent variables

a. 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 values are between 0and 6. The value 6 indicates 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 than 0.1, 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 2 years of data.
- Data on loans below 1% of income per capita.

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[1] The World Bank

- 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. Countries with the highest value (6) of this variable in 2011 are: Argentina, Armenia, the Bolivia, Guatemala, Macedonia, Mexico, Panama, Peru, South Africa, and Uruguay.

b. Control variables

To better capture the effect of information sharing on access to credit, we add four macroeconomic and financial variables in the two models. Data are collected from various sources. Appendix B summarizes variables definitions and data sources.

Our choice of control variables follows the common practice in the literature on access to credit and defaults. We control the credit interest rate (RIR), based on the theory of microfinance, which suggests that a high interest rate[1] reduced the probability of access to credit for the poor borrowers whose profitability is below the practical interest rate[2]. Thus, in the same vein, several researches show a positive relationship between the interest rate and the defaults (Saurina 2005, Flay 2005, Bochaberi 2006, Bofondi and Ropele, 2011). This means that a high interest rate increase non-performing loans.

We introduce the inflation rate (INF), to control the macroeconomic stability of each country. Boyd, Levine and Smith (2001) show that countries where inflation is high and volatile[3] have underdeveloped financial system[4] , and therefore face difficulties in the supply of credit and an increase in defaults (Fofack, 2005). Huybens and Smith (1999) argue that inflation exacerbates information asymmetries[5] and reduced access to credit. We also monitor the growth of GDP, as a rapid expansion of the economy may require more credit. Also, a high GDP is negatively associated with defaults (Salas & Saurina 2002; Rajan & Dhal 2003, Fofack 2005 and Jimenez & Saurina 2005). This indicates that the strong positive real GDP growth usually results in a higher income, which improves the ability to

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[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 Wanjau2011).

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

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

service the debt of the borrower which in turn contributes to honor its commitments.

In the model of access to credit, we include also Rule of law (RL), 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 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.

In the model of defaults, we add the unemployment variable. As it is affirmed in the literature that an increase in the unemployment rate depreciates purchasing power of households and reduces the capacity of production companies and therefore lower revenue that prevents borrowers to meet their financial obligations.

3.2. Methodology
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, Romania, 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.

3.2.2. Estimation method and choice of the optimal model
After a broad brush of empirical studies, we examine the different variables that may influence the access to credit and defaults. This allows us to locate us on a static panel data model in order to realize this issue empirically.

Before estimate the model of panel data, the thing that should be checked is the homogeneous specification of the generator process data, that is, whether the model is homogeneous estimated by OLS or heterogeneous mobilizing other estimators. It should be noted that the models that we will use in this study are simple linear models of the type: $y_{it} = \alpha_i + \beta_i X_{it} + \varepsilon_{it}$. And which are also written as follows:[1]

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[1]It should be noted that the parameters α_i, β and the error term ε_{it} of the equation of the access to credit are different to those of the default equation.

Regression 1: Access to credit

$$DCP_{it} = \alpha_i + \beta_{1i}GDP_{it} + \beta_{2i}CDI_{it} + \beta_{3i}INF_{it} + \beta_{4i}RIR_{it} + \beta_{5i}RL_{it} + \varepsilon_{it}$$

Regression 2: Defaults

$$NPL_{it} = \alpha_i + \beta_{1i}GDP_{it} + \beta_{2i}CDI_{it} + \beta_{3i}INF_{it} + \beta_{4i}RIR_{it} + \beta_{5i}UNP_{it} + \varepsilon_{it}$$

With: i = 1...30 (country), and t = 1...19(years)

DCP_{it} Measure of access to credit designated by domestic credit provided to the private sector (% of GDP) in the ith country and at time t. NPL_{it} measure of defaults specified by the non-performing loans as a percentage of total loans. GDP_{it} Represent the GDP growth. CDI_{it} The index of sharing credit information. INF_{it} Refer to inflation rate. RIR_{it} Real interest rate. RL_{it} Index of rule of law. UNP_{it} Unemployement rate. ε_{it} error term.

3.2.2. 1. *Specification test*

The objective of this step is to discriminate between the specific effect (existence of the specific characteristics for each country) so-called model heterogeneous and the common effect (absence of the specific characteristics for each country) called homogeneous model. This discrimination is done using the Fisher test. The latter is based on the following hypotheses:

$$H_0: \alpha_i = \alpha, \forall i \in [1,30]$$
$$H_a: \exists (i,j) \in [1,30] / \alpha_i \neq \alpha_j$$

With: $F = \dfrac{(SCR_1 - SCR_2)/(N-1)}{SCR_2 /[N(T-1)-K]}$, we assume equality of β_i parameters

Indeed, if the model is heterogeneous, the application of ordinary least squares is not justified. If F < Ft therefore we accept the null hypothesis test that confirms the homogeneity of the model and rejects its heterogeneity. The test results are:

Table 1: Specification test (homogeneity of α_i)

$H_0: \alpha_i = \alpha,$ $\forall i \in [1,30]$	Regression	$F_{(29,535)}$ calculed	$F_{(29,535)}$ tabulated	Conclusion	Type of effect
	Access to credit	94,6	1,46	H_0 Rejected	Specifique effect
	Defaults	23,67	1,46	H_0 Rejected	Specifique effect

Source: Prepared by the researcher in Eviews

According to the above table, the Fisher statistic calculated is greater than the Fisher statistic tabulated in both cases. It is therefore necessary to reject the null hypothesis, indicating that the constant α_i differs from one country to another whether in terms of access to credit and defaults. This test leads us to reformulate our models as follows:

Regression 1: Access to credit

$$DCP_{it} = \alpha_i + \beta_1 GDP_{it} + \beta_2 CDI_{it} + \beta_3 INF_{it} + \beta_4 RIR_{it} + \beta_5 RL_{it} + \varepsilon_{it}$$

Regression 2: Defaults

$$NPL_{it} = \alpha_i + \beta_1 GDP_{it} + \beta_2 CDI_{it} + \beta_3 INF_{it} + \beta_4 RIR_{it} + \beta_5 UNP_{it} + \varepsilon_{it}$$

3.2.3. 2. Test of specific effects

In the econometric literature, the rejection of the homogeneity of the data leads to two types of models: fixed effects models where the constant α_i is a deterministic variable, and random effects models where the constant is a random variable. The distinction between these two models is done through the Hausman test (1978). According to this test, the null hypothesis shows that the estimator MCG is better than LSDV estimator. The test results are:

Table 2 : Hausman test (1978)

H_0: Random effect Model	Regression	Test d'Hausman	P-value	Specification model	Estimator
	Access to credit	5.55	0.253	random effect model	GLS
	Defaults	9.20	0.10	random effect model	GLS

Source: Prepared by the researcher in Eviews

From the results shown in the table above, we note that the P-value is more than 5% in both regressions, so we opted for the random effects model. So the best estimator of the credit access and defaults is the GLS method.

4. Empirical results

4.1. Analysis of the results of Panel A: Access to credit

From table 3, we note a positive and significant coefficient of credit information index (CDI) at 1% level. 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 in panel A, shows that a 1% improvement in sharing credit information increases the ratio of credit private by approximately 5%. These results confirm those obtained in most 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)). These empirical studies show that in countries where there are systems that collect and share information on borrowers, the private credit / GDP ratio is higher.

4.2. Results analysis of Panel B: Defaults

We note from Panel B, a significant and negative correlation between the index of sharing credit information (CDI) and defaults (NPL). This results support the idea that the presence of a device of sharing information on borrowers' history plays a disciplinary role allowing a reduction in default rate. Where better sharing of

credit information is put into practice, an improvement in the selection of borrowers and reduce moral hazard are expected, by increasing the effort of borrowers to repay their loans. From table 3, an improvement of 1% in the exchange of information between lenders depreciates the default rate approximately by 1.5 %. Credit bureaus allow obtaining a disciplinary effect on borrowers who are encouraged to provide sufficient efforts to success their projects and repay their loans. This result allows us to validate the second hypothesis of this work which postulates a negative relationship between these two factors , which is also consistent with several studies (Jappelli and Pagano (2001) , Kallberg and Udell (2003), McIntosh et al (2006) , Doblas -Madrid and Minetti (2010)) .

Table 3: Estimation results

Independentes variables	Panel A : Access to credit (DCP) Dependant variable		Panel B : Defaults (NPL) Dependant variable	
	Coefficients	t-Statistic	Coefficients	t-Statistic
Constant	32.293 (0.000)	16.266	11.695 (0.000)	9.024
RL	-0.856** (0.690)	-0.736	…	...
RIR	0.001** (0.896)	0.215	0.105* (0.001)	3.224
INF	-0.030*** (0.034)	-0.106	0.011*** (0.103)	1.645
CDI	**4.951*** (0.000)**	13.473	**-1.497*** (0.000)**	-8.755
GDP	-0.909** (0.000)	-7.137	-0.315** (0.000)	-5.750
UNP	…	...	0.251* (0.000)	4.227

P-value in parentheses. (*), (*) and (**) Coefficients significant respectively at 1%, 5% and 10% .
Source: Prepared by the researcher in Eviews

Conclusion

The presence of credit information sharing systems is an important factor on the credit market offering a complete picture on 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 4.95%.

The results reached by our study suggest also that the existence of information sharing systems on the creditworthiness of borrowers, whether private or public, in countries is likely to improve the quality of loans accorded. We obtain a negative and significant coefficient for the variable of information sharing in panel B, indicating that a large diffusion of credit information among lenders reduces the incidence of defaults payment.

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