

# What explains high interest rates in Belize?

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## Abstract

We examine prevailing causes for high interest rates in Belize using econometric techniques. The evidence found in this paper points out to regulation, competition and efficiency as the main factors explaining the high rates. Saving interest rates were high in the past, influenced by the minimum rate regulation, but currently this rate is much lower. The spread has been falling as well, approaching more developed economies of the Caribbean, such as Barbados. Nevertheless, we find evidence that the spread could be lower if the country can reduce the very high percentage of nonperforming loans, increase competition, improve technical efficiency, and move to less costly prudential regulations (such as reducing or eliminating non-remunerated reserve requirements).

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.

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## Contents

1. Introduction.....	4
2. Banking system in Belize.....	6
3. Borrowing Rates.....	14
4. The Economics of Interest Rate Spread .....	21
4.1 Factors affecting spreads .....	24
4.2 Data and econometric modeling .....	28
4.3 Empirical results .....	31
5. Assessing market power in the Belizean banking sector .....	35
5.1 Methodology .....	35
5.2 Data description .....	39
5.3 Results.....	41
6. The inefficiency hypothesis .....	45
7. Conclusions.....	48
References .....	52
Annex 1. International comparison in credit conditions .....	58

## Index of Tables

Table 1. Financial Sector composition .....	10
Table 2. Percent of firms with a bank loan/line of credit .....	13
Table 3. Percent of firms identifying access to finance as a major constraint .....	13
Table 4. Proportion of loans requiring collateral (%).....	13
Table 5. International benchmarking of interest rates .....	15
Table 6. Explaining real interest rate in Belize, cross country comparison .....	16
Table 7. Non performing loans (as a % of total loans).....	19
Table 8. Non performing loans (as a % of total loans) – Belize vs Barbados .....	20

Table 9. Descriptive statistics.....	29
Table 10. GMM and FE regressions (NIM as dependent variable).....	31
Table 11. The effect of changes in CRR on the spread .....	33
Table 12. FE estimation of ROAE .....	34
Table 13. Summary Statistics for Belizean Banking Sector 2002Q2-2012Q2.....	41
Table 14. Nonlinear Simultaneous Equation System Estimation.....	42
Table 15. Panzar-Rosse H-Statistic Estimation.....	44
Table 16. Efficiency scores for Caribbean and Latin American countries – 2002-2009 .....	47
Table 17. Financial Sector. Enterprise Survey Result by firm size.....	58
Table 18 (cont.). Financial Sector. Enterprise Survey Result by firm size.....	59

## Index of Figures

Figure 1. Belize. Macro finance indicators. ....	7
Figure 2. Cross country comparison of the stock of Public Debt in 2012, the top 30 most indebted .....	8
Figure 3. Evolution of saving and real interest rates in Belize, 1986-2008 .....	9
Figure 4. Recent evolution of interest rates in Belize .....	17
Figure 5. Spread of commercial lending rate and time deposit rate in Belize.....	18
Figure 6. Recent evolution of deposit interest rate and spreads in the region.....	19
Figure 7. Ex-ante and Ex-post spreads (%).....	21
Figure 8. Herfindahl-Hirschman Index .....	25

## 1. Introduction

Access to credit has been identified in Belize as a binding constraint to growth (Hausmann and Klinger (2010), Martin and Manzano (2010), IMF (2011), García, Novello and Vellos (2009)). The lending interest has remained high, in spite of Belize's long track record of low inflation. Real interest rate in the 2000s has been around 13%, the second highest in the Caribbean (after Haiti) and in the top 20 (highest) among 150 countries in the world. In the same direction, sixty seven percent of the firms surveyed in the Enterprise Survey of the World Bank identified access to finance as a major constraint, well above the average for Latin American and the Caribbean (30.8%) and the world (31.7%) – very high for the Caribbean standards, as Barbados has only 41%, Guyana 18.3% and the Bahamas 12.9%.

Even though most studies on Belize's financial sector agree that access to finance is a problem, opinions have differed when it comes to identify the causes of high interest rates on lending. Some argue that low savings is a problem. Hausmann and Klinger (2010) argue that bank competition for scarce savings is pushing interest rates high. García, Novello and Vellos (2009) points out that commercial banks had historically shown a tendency to restrict their activity to the productive sector, directing credit to consumption. IMF (2011) - the 2011 Article IV Staff Report of the IMF for Belize- concludes that the government's financing requirement put upward pressure on reserve requirements contributing to a high cost of finance, because these reserves are not remunerated.

Others studies point at poor regulation and lack of proper competition, arguing that interest rate spreads are high. There are very different potential causes of high interest rate spread, such as: lack of competition, perceived market and credit risks, bank unsoundness, scale diseconomies constrained by small markets, high operating costs due to low efficiency, unfavorable institutional environment, and existence of various regulatory constraints distorting financial market activity. In the case of Belize, there are some works pointing out evidence in different directions. Mendoza (1997) identifies the low level of competition in the Belizean banking system as a primary reason for interest rate spreads being higher than in Barbados, a Caribbean country with a similar exchange rate regime and higher reserve requirements. Perez (2011) –a Central Bank of Belize publication- also concurs with the

conclusion that interest rate spreads are high. According to Perez the high spreads are explained by lack of competition but also by adversely classified loans (which are related to credit risk and could be either a collateral effect of lack of competition, deficiencies in the information system, regulations such as collateral or with the enforcement of property rights). Reserve requirements, on the other hand, explain just under half to 12 percent of the interest rate spread. Another Central Bank report, Metzgen (2012), stresses that historically Belize's banking system has been characterized by high and relatively stable spreads between lending and deposit rates. This report identifies as the sources of the high spread as: (i) high unremunerated reserve requirements and lending to government at below-market rates to meet liquid asset requirements has constituted an implicit tax on the financial sector; and (ii) high operating costs and an oligopolistic-type market structure are other factors that might have contributed to wide spreads.

In the last years, however, Belize has been able to reduce both the lending rate and the interest rate spread. In 2000, the interest rate spread of Belize was 300 basic points above Barbados, currently this difference is less than 100 (but still higher than the world average).

Based on 2008 multilateral organizations recommendations, Belize introduced market-based instruments of liquidity management aimed at reducing high spreads and improving financial intermediation. In 2010 and 2011 the Central Bank has lowered the floors on interest rates for saving deposits. Cash reserve requirements have been lowered over the years. The security reserve requirement was reduced to zero in 2011. Competition was introduced by creating a state development financial institution. However, bank credit growth declined as fewer investment opportunities and high non-performing loans (NPLs) continued to constrain new lending, Metzgen (2012). Domestic credit to the private sector declined in the last years from 63% of the GDP in the pre-international crisis 2008 to 60.3% in 2011.

The goal of this article is to analyze the current situation and identify the prevailing causes for high interest rates in Belize based on quantitative methods. For this purpose we will follow different approaches that have been used in the literature, relying on econometrics models (based on commercial banks data). Section 2 describes briefly the banking system in Belize. We focus our analysis on commercial banks since we have complete data for our

analysis only for them. Section 3 discusses the borrowing costs for banks, exploring the role that regulations such as the minimum saving rate has played on the high interest rates observed in Belize. Section 4 explores the components of the interest rate spread in the country. Section 5 studies the degree of competition in the industry, a usual concern in a small economy. Section 6 explores the inefficiency hypothesis, which might be related to the degree of competition. Section 7 presents the main conclusions.

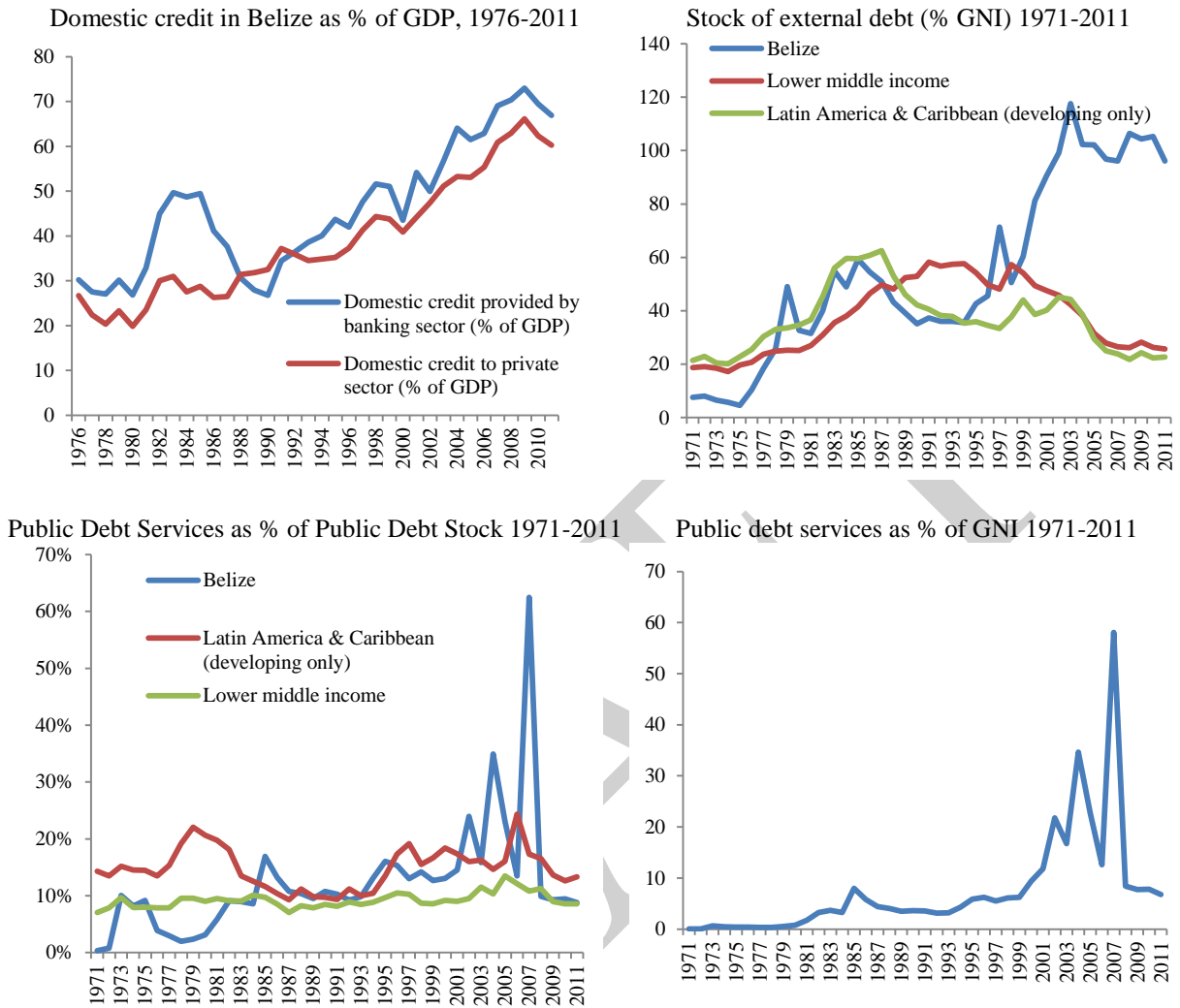
## **2. Banking system in Belize**

Belize is a small open economy (349,000 inhabitants) classified as lower middle-income country according to the World Bank (with a current GDP per capita of US\$ 4,059 in 2011). The exchange rate in Belize is pegged to the dollar and the central bank is required to maintain external assets amounting to at least 40% of the monetary base. Inflation rate has been historically low, recording an annual rate of 1.96% on average in the last 10 years.

Its financial depth is consistent with its level of development, and it has shown a healthy deepening, as the ratio of domestic credit to the private sector rose from 32.5% to 60.3% of the GDP between 1990 and 2011. The percent of firms with a bank loan or a line of credit is consistent with its level of development as well, according to the results of the Enterprise Survey of the World Bank. But the same survey shows that a very high percentage of firms find access to finance as a binding constraint, what points out to high interest rates as the main concern.

Public debt management has been an issue in Belize. Currently, the stock of public debt is estimated in 85% of the GDP, the 18<sup>th</sup> highest in the world (among 145 countries), but lower than other Caribbean countries (6 of the 30 top indebted countries are from the Caribbean, what shows high debt is a structural problem in the region). The stock of external debt is very high as well. Most of the domestic credit provided by the banking sector is given to the private sector (see Figure 1). The stock of external debt and public debt are positively correlated with the credit provided by the banking sector.

**Figure 1. Belize. Macro finance indicators.**



Source: World Development Indicators, the World Bank

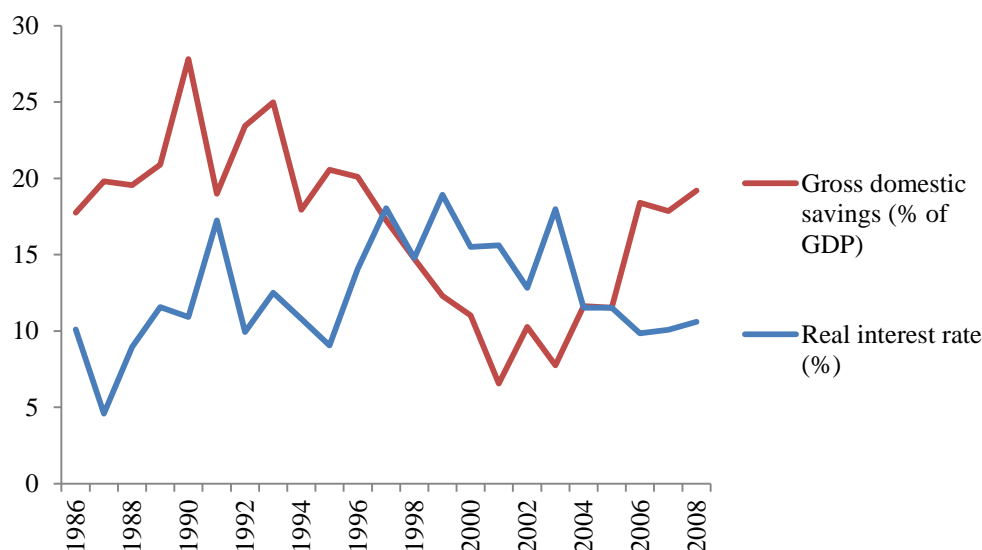
**Figure 2. Cross country comparison of the stock of Public Debt in 2012, the top 30 most indebted**

Rank	Country	Public debt (% of GDP)	
1	Zimbabwe	220.1	
2	Japan	211.7	
3	Saint Kitts and Nevis	200	
4	Greece	161.7	
5	Lebanon	134	
6	Iceland	128.3	
7	Jamaica	125.5	
8	Italy	120.1	
9	Eritrea	118.5	
10	Singapore	118.2	
11	Portugal	112.8	
12	Ireland	105.4	
13	Belgium	99.7	
14	Barbados	95.9	
15	Sudan	93.7	
16	Canada	87.4	
17	United Kingdom	86.3	
18	Belize	84.8	
19	France	84.7	
20	Sao Tome and Principe	84.7	
21	Egypt	83.4	
22	Sierra Leone	82.9	
23	Germany	81.8	
24	Hungary	80.6	
25	Sri Lanka	79.4	
26	Bhutan	78.9	
27	Burundi	78.4	
28	Dominica	78	
29	Cape Verde	74.2	
30	Austria	73.6	

Source: CIA World Factbook



**Figure 3. Evolution of saving and real interest rates in Belize, 1986-2008**



Source: World Development Indicators, The World Bank

### **Banking Sector**

As in any small economy, there are only a few commercial banks and concentration is relatively high. The total assets for the financial sector of Belize in 2011 amounted to \$3.25b. Commercial banks (5 in 2012) account for 65%, but only two of them concentrate almost 70% of the commercial banks loans.<sup>1</sup> Three of these banks are based in Belize – Heritage Bank, Belize Bank and Atlantic Bank — and two, First Caribbean Bank (formerly Barclays)<sup>2</sup> and ScotiaBank, are large multinational banks with branches in Belize. The local banks are small. In addition to these five commercial banks, the financial sector in Belize comprises seven offshore banks (offering mostly offshore services to non-residents), fourteen credit unions, twelve insurance companies, and one development bank.<sup>3</sup>

<sup>11</sup> For a historical view of the development of Belize’s financial system from 1970 to 1995 see Vellos and Sosa (1996).

<sup>2</sup> The First Caribbean Bank was formed in 2003 by the merger of the Caribbean operations of Barclays and the Canadian Imperial Bank of Commerce (CIBC). It operates in 17 Caribbean countries including Belize.

<sup>3</sup> Offshore banks are regulated by the Belize Central Bank, have physical offices in Belize and offer various services including international bankcards and demand, savings and time deposit accounts. Accounts maintained with these banks are not subject to local taxes or exchange control restrictions and may be denominated in any major currency, including U.S. dollars, euros and others. International banks tout their privacy for their customers, although if the Belize courts find that funds in the banks are proceeds of crime the

**Table 1. Financial Sector composition**

	1996			2011		
	Number of institutions	Total Assets, BZ\$ millions	Structure (%)	Number of institutions	Total Assets, BZ\$ millions	Structure (%)
Commercial Banks	4	706,5	76,2%	5	2120,5	65,1%
Credit Unions	11	105,8	11,4%	14	414,7	12,7%
International Banks	0		0,0%	7	357,9	11,0%
DFC	1	62,5	6,7%	1	217,2	6,7%
Insurance Companies	15	52,6	5,7%	12	148,4	4,6%
<b>Total</b>		<b>927,4</b>	<b>100,0%</b>		<b>3258,7</b>	<b>100,0%</b>

Source: Metzgen (2012)

A few changes in the last decade increase competition in the system. In 2001 started operations the Alliance Bank of Belize Ltd. (the fifth bank to enter the market). In addition, an amendment to the International Banking Act in 2002 that allowed resident commercial and export processing zone companies to conduct full banking business with international banks operating in Belize enabled the latter to cut into a portion of the foreign exchange earnings that the domestic banks traditionally received as EPZ companies shifted some deposits and borrowing activities from the commercial banks to the international banks, García, Noyelo and Velloso (2009).

The number of bank branches more than doubled from 21 to 45 and ATM services that were first launched domestically in 1993 have gradually spread throughout the country, with the limitation of lack of full interconnectivity. Online banking started in 2003 enabling customers to view account details, transfer funds (typically between accounts in the same bank), and pay a limited number of bills online.

Some limitations to competition in the banking sector are the lack of interconnectivity among ATMs,<sup>4</sup> the lack of a Credit Bureau, manual check clearing,<sup>5</sup> the interbanking credit

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banks are required to release the identity of the account owner. Funds are transferred into and out of Belize in foreign currencies with no conversion to Belize dollars taking place.

<sup>4</sup> Commercial banks' POS/ATM mechanisms are not connected via a local network but are interoperable through an international network. Without an Automated Clearing House (ACH) to connect financial institutions, customers can only make electronic funds transfers such as direct credits, direct debits, and online payments on an intrabank basis.

<sup>5</sup> The cheque is the primary non-cash payment instrument used in Belize. The cheque clearing system facilitates the deposit of cheques to any bank, not just to the bank against which it is drawn. However, the

and clearing process, the lack of modern consumer protection laws. The practice of requiring a recommendation letter from a bank where the person is already (or was) a customer to open a new account might respond to the extent of the asymmetric information problem, but might be seen also as a practice to impede competition. The Central Bank of Belize has already started to implement measures to improve some of these issues. It is elaborating a plan to implement a Credit Bureau; there is an ongoing Payments System Reform with the technical assistance of The World Bank, with the objective of increasing the safety, efficiency and integrity of the payment system through implementation of a modern payment systems infrastructure; there would be new measures to address liquidity, credit, operations, and legal risks in accordance with international standards.

The Central Bank has taken other measures to strength the regulatory framework. It was revised the methodology for determining the appropriate classification of loans and other assets, prescribed new procedures for establishing and maintaining loan loss reserves and specified the appropriate accounting treatment of interest on loans and other interest bearing assets. These changes became effective on 1 December 2011.

There was a reduction in the minimum interest rate on savings deposits (reduced to 2.5% since October 2011)<sup>6</sup> and domestic commercial banks were simultaneously instructed to calculate interest on the daily available closing balances held in savings accounts rather than on the minimum balance held in such accounts during a designated period, whether monthly, quarterly or annually, as had been the standard practice. In the interest of greater transparency, the commercial banks were also required to disclose their annual nominal and effective interest rates on savings deposits to customers and to the general public.

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system is totally manual which increases its processing cost and settlement time, currently three days for district and seven days for out district cheques.

<sup>6</sup> Belize has historically used minimum saving rates and minimum lending rates as instruments to manage the monetary policy. To reduce credit they increased the minimum lending rate, to increase saving the regulated the minimum saving rate. The minimum lending rate was abolished, and now the only instrument used has been the minimum saving rate.

There have been also measures to reduce the high percentage of nonperforming loans. There was writing off of some \$45.0mn in non-performing loans, the Central Bank encouraged bankers to focus on the repayment capacity of borrowers rather than on the value of their collateral, and directed the banks to increase their provisions for nonperforming loans on 1 December of 2011. The write-offs and increase in loan loss provisioning reduced the ratio of non-performing loans (net of specific provisions) to total commercial banks' loans and advances from 16.1% in 2010 to 14.5%.

### *Access to credit for SMEs*

A concern in Belize is that the majority of the credit extended by commercial banks goes to large and medium sized-firms (93%) and it is strongly concentrated in the real estate and construction sector (33%) followed by consumer loans (24%). However, it is always hard to distinguish to what extent this concentration is due to demand factors or to distortions in the loan assignment. The Enterprise Survey of the World Bank shows that small firms in Belize identify access to finance as a major constraint to do business more than large firms. This asymmetry is common among other countries too. In Belize, 67.5% of the small business identify access to finance as a major constraint, which is astonishing compared to Caribbean countries, Latin America or the world average; but it is also true that large business identify access to finance as a major problem too (50.1%). If we compare large and small firms, the share of small firms complaining is 35% larger than the share among large firms, a difference which is close to the world average (37%), and below the average for Latin America and the Caribbean (49%); therefore, it seems the problem is not just access to finance for small firms, which is not unusually more adverse than large firms, but a generalized problem of the economy.

**Table 2. Percent of firms with a bank loan/line of credit**

	Belize	Barbados	Bahamas, the	Guyana	Latin America & Caribbean	World
Total	43.9	58,2	34,2	50,5	47.6	35.6
Small (5-19)	43.7	58,1	28,4	38,9	40.4	29.3
Medium (20-99)	41.6	53,5	43,6	54,6	56.4	43.9
Large (100+)	77.3	75,6	35,0	63,9	67.5	55.1

Source: Enterprise Survey, The World Bank

**Table 3. Percent of firms identifying access to finance as a major constraint**

	Belize	Barbados	Bahamas, the	Guyana	Latin America & Caribbean	World
Total	66.8	41,1	12,9	18,3	30.8	31.7
Small (5-19)	67.5	44,8	12,0	17,2	31.8	33.4
Medium (20-99)	66.1	28,2	17,8	19,6	29.3	29.6
Large (100+)	50.1	56,1	1,9	17,1	21.4	24.4

Source: Enterprise Survey, The World Bank

**Table 4. Proportion of loans requiring collateral (%)**

	Belize	Barbados	Bahamas, the	Guyana	Latin America & Caribbean	World
Total	97.5	50,9	81,3	84,5	72.4	77.9
Small (5-19)	97.9	31,9	74,1	96,3	70.6	77.3
Medium (20-99)	96.0	92,0	85,6	79,6	74.6	81.1
Large (100+)	100.0	91,9	96,4	79,5	75.5	80.4

Source: Enterprise Survey, The World Bank

The credit coverage is not bad, as 44% of the firms have access to credit, above the world average but low compared to Barbados or Guyana, or the average for Latin America and the Caribbean. Another particular aspect of the financial sector of Belize is the very high use of collaterals and the high proportion of investment financed internally (see Annex 1) what suggest that the problem seems to be more the cost of finance than funding.

### 3. Borrowing Rates

The net interest margin or interest rate spread -the difference between lending and borrowing rates- is a commonly accepted measure of how costly bank intermediation services are for a society. Research shows that the cost of financial intermediation, which is correlated with the level of development of the financial system, has important repercussions for economic performance. In economies where capital markets are not well developed, banks loans are the main external source of finance for small and local firms, and the cost of intermediation plays an even more important role. Usually the focus of the analysis when a country has high lending rates is the spread, but in the case of Belize is important first to analyze the behavior of saving rates as they are affected by regulation.

Comparing with other countries in the region and with countries with the same income level (see Table 5), Belize shows high deposit interest rates, high real interest rate, reasonable interest rate spreads and very high risk premium on lending, confirming that the cost of finance is a concern, but that high deposit rates and high risk premium are important factors that explain the high lending rate more than high spread. Risk premium on lending is the interest rate charged by banks on loans to private sector customers minus the "risk free" Treasury bill interest rate at which short-term government securities are issued or traded in the market. This high premium favors Metzgen's argument that lending to government at below-market rates to meet liquid asset requirements has constituted an implicit tax on the financial sector.

**Table 5. International benchmarking of interest rates**

	Income Level	Risk premium on lending (prime rate minus treasury bill rate, %)				Interest rate spread (lending rate minus deposit rate, %)				Deposit interest rate (%)			
		1980s	1990s	2000s	2011	1980s	1990s	2000s	2010	1980s	1990s	2000s	2010
Belize	LMI	5,78	10,33	10,66	10,94	4,73	6,69	6,99	5,84	11,04	8,59	7,57	7,76
Bahamas, The	HI	3,90	3,27	4,07	3,81	3,46	2,02	1,92	1,79	6,68	5,36	3,83	3,44
Barbados	HI	3,81	3,45	5,72	5,29	4,44	5,27	5,75	5,98	5,67	5,17	3,71	2,67
Dominica	UMI	3,56	4,93	3,79	2,44	4,71	7,03	6,71	6,29	5,19	4,32	3,48	3,26
Guyana	LMI	2,73	4,21	10,38	11,97	2,99	6,66	11,40	12,23	12,05	15,40	3,90	2,27
Jamaica	UMI	6,20	8,38	1,85	12,92	6,58	13,73	10,25	10,95	14,60	23,76	8,25	6,35
St. Kitts and Nevis	HI	3,77	4,59	3,11	2,70	3,66	6,46	5,72	4,11	6,55	4,63	4,44	4,59
St. Lucia	UMI	6,53	6,05	6,20	5,75	4,80	7,51	7,90	7,15	7,54	4,56	3,79	3,32
St. Vincent and the Grenadines	UMI	4,92	5,04	4,55	4,97	5,80	7,34	6,81	6,43	5,62	4,21	3,57	2,86
Trinidad and Tobago	HI	7,97	5,86	6,03	7,44	5,38	6,65	7,13	7,12	6,18	7,01	5,00	1,51
Albania	LMI	-	1,60	7,58	6,97	-	2,84	7,98	6,17	-	19,89	6,91	6,42
Papua New Guinea	LMI	1,66	0,78	3,18	6,67	3,25	6,74	9,56	8,24	9,06	7,07	2,97	1,38
Seychelles	UMI	0,21	3,74	5,67	6,96	0,58	6,27	6,53	7,75	9,55	8,78	4,51	2,86
Fiji	LMI	-	5,70	4,90	5,27	-	3,39	4,47	3,41	-	4,12	3,38	5,41
Papua New Guinea	LMI	1,66	0,78	3,18	6,67	3,25	6,74	9,56	8,24	9,06	7,07	2,97	1,38
World		5,84	6,23	6,43	6,84	1,50	6,76	6,68	6,23	126,05	34,68	6,78	4,89
Simple Average													
World		6,68	7,63	6,56	6,84	13,24	13,24	8,69	7,80	54,09	13,24	8,69	7,80
Caribbean		4,92	5,61	5,64	6,82	4,66	6,94	7,06	6,79	8,11	8,30	4,75	3,80
LMI		3,27	6,49	6,74	6,18	11,23	11,23	9,67	9,01	238,09	11,23	9,67	9,01
UMI		4,85	14,17	6,06	6,69	22,46	22,46	8,58	6,36	11,34	22,46	8,58	6,36

Source: WDI

Notes: LMI : Lower middle income, UMI: Upper middle income, HI: High income. Interest rate spread is the interest rate charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits. Risk premium on lending is the interest rate charged by banks on loans to private sector customers minus the "risk free" treasury bill interest rate at which short-term government securities are issued or traded in the market. In some countries this spread may be negative, indicating that the market considers its best corporate clients to be lower risk than the government.

Deposit interest rate is the rate paid by commercial or similar banks for demand, time, or savings deposits.

The real interest rate in Belize has been high for its level of development, size of the economy and savings. Cross country regressions based on average figures for 2005-2011 (using robust methods) predict for Belize a real interest rate of 7.15%, below the 11.7% observed in this period.

**Table 6. Explaining real interest rate in Belize, cross country comparison**

Country		Real Interest Rate	Predicted Real Interest Rate	Difference
Belize	BLZ	11.72	7.15	4.57
Barbados	BRB	5.08	5.48	-0.40
Bahamas, The	BHS	4.33	4.04	0.28
Dominica	DMA	8.70	7.73	0.96
Guyana	GUY	6.50	7.52	-1.02
Haiti	HTI	11.22	6.04	5.17
St. Kitts and Nevis	KNA	6.19	5.31	0.88
St. Lucia	LCA	6.89	6.86	0.04
St. Vincent and the Grenadines	VCT	6.70	7.86	-1.15
Trinidad and Tobago	TTO	3.21	1.98	1.23
Benchmark economies				
Chile	CHL	2.54	3.65	-1.11
Costa Rica	CRI	8.48	5.20	3.28
Uruguay	URY	4.92	5.09	-0.17
Tonga	TON	5.48	8.05	-2.57
Fiji	FJI	2.68	7.36	-4.68

*Notes:* Real interest rate explained by: GDP per capita, PPP constant 2005 international \$ (gdp), Gross savings as % of GDP (sav), log of Population (pop), and Strength of legal rights index. The results are the following:

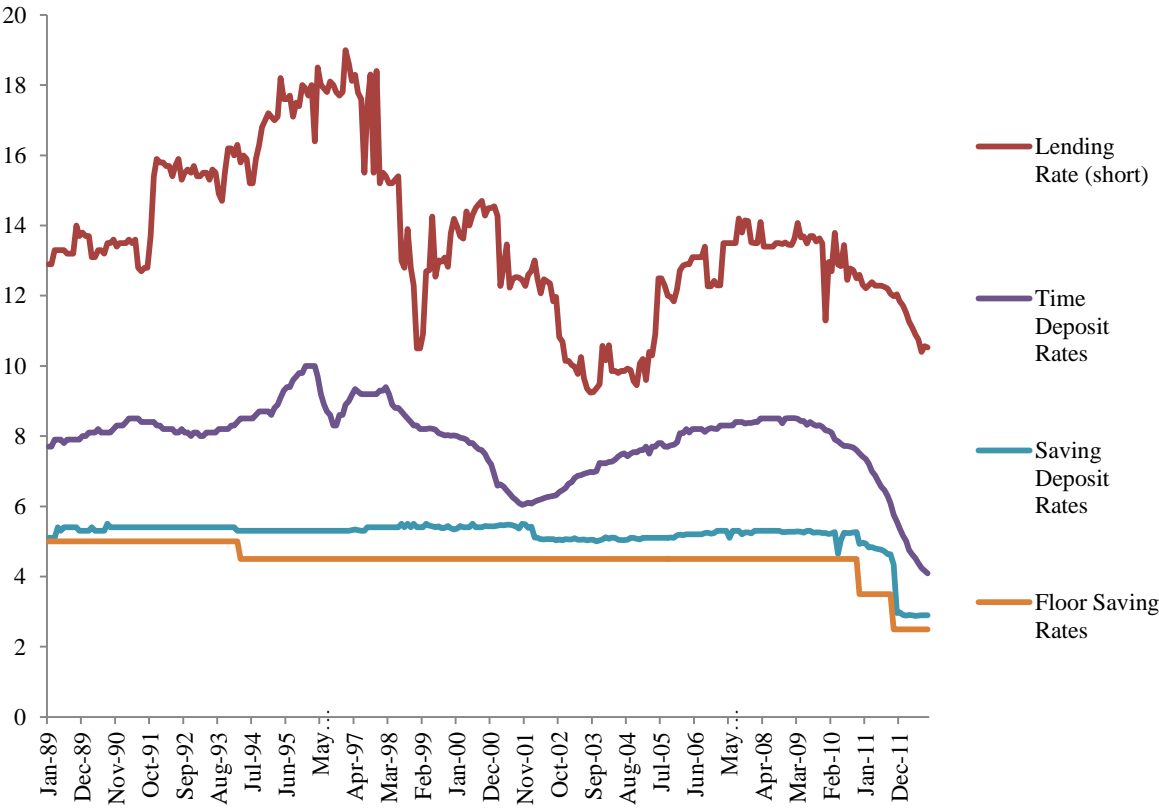
	Coef.	Std. Err.	<i>p</i> -value
gdp	-0.0003	0.0001	0.002
gdp (squared)	0.0000	0.0000	0.050
sav	-0.0678	0.0313	0.032
lpop	-0.3610	0.1681	0.034
legindex	0.2987	0.1441	0.040
constant	12.3969	2.7535	0.000
F (Global significance)	7.5100		0.000
Obs.	131		

The unpredicted part of the high real interest is very high. Since savings is included in the regression, the argument of Haussmann and Klinger (2010) that low savings pushes banks



to rise saving interest rates to attract scarce deposits seems not plausible. On the contrary, the high deposit interest rate seems more related to regulated floor rates, as the most recent evolution of deposit rates shows that after the reduction of the minimum rate of interest payable on ordinary saving deposits, deposit rates reduced significantly, see Figure 4.

**Figure 4. Recent evolution of interest rates in Belize**



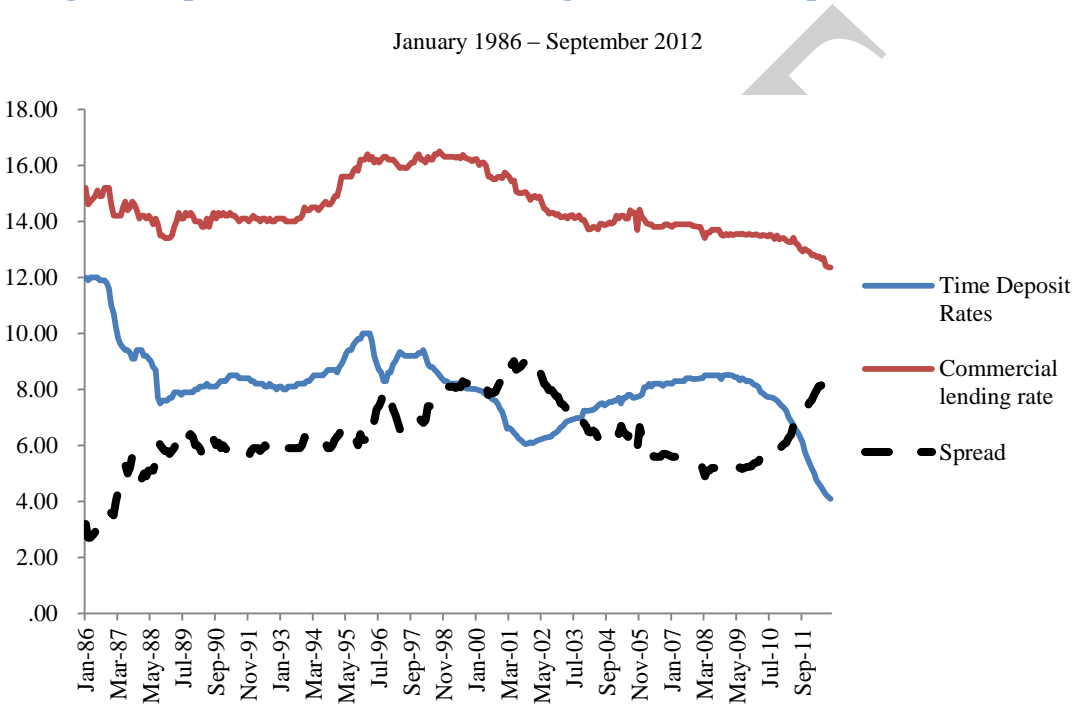
Source: Central Bank of Belize

The minimum rate was settled in March 1989 at 5%, reduced to 4.5% in March 1994, and then hold constant at this high level after the recent modifications of the Central Bank, that following IMF suggestion reduced the minimum rate from 4.5% to 3.5% in November 1<sup>st</sup> 2010, and then further to 2.5% in October 2011. As shown in the previous figure, the reduction in the minimum saving rate helped to reduce the saving rate as well as the deposit and the lending rate (on average).

The (observed) spread has increased in the last year, as the average lending rate does fall at a slower pace due to the maturity of the loans. The observed spread has the problem of

composition bias since it is not constructed with marginal interest rate but rather with the interest income of banks loans, which is a weighted average lending interest rate of all the commercial banks loans given in different time periods. It cannot be concluded from this evidence that lower saving rates are not transmitted in lower lending rates. In addition, for the same period the Bahamas and Guyana also show a slightly increase in the spread.

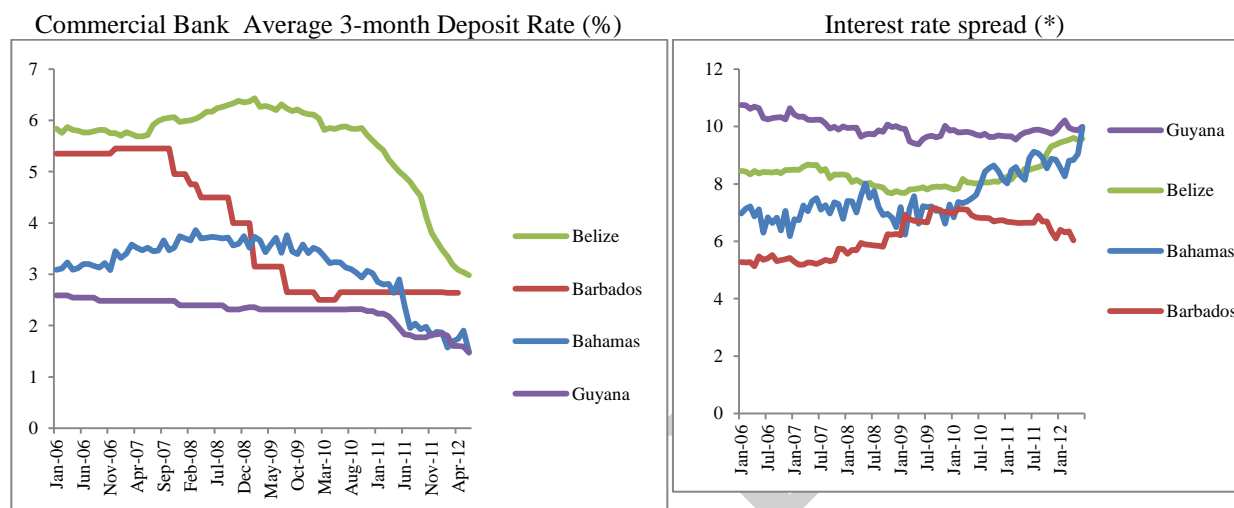
**Figure 5. Spread of commercial lending rate and time deposit rate in Belize**



Source: Central Bank of Belize

Figure 6. Recent evolution of deposit interest rate and spreads in the region

January 2006-July 2012



Note: (\*) Difference between Commercial Bank Weighted Average Loan Rate (%) and Commercial Bank Average 3-month Deposit Rate (%). Source: Caribbean Center for Money & Finance

Another characteristic of Belize is the relatively high percentage of non-performing loans of commercial banks. According to the most recent information (third quarter of 2012) none of the five commercial banks has a rate below the prudential benchmark (5%).

Table 7. Non performing loans (as a % of total loans)

	2012	2011	2010	2009	2008	2007	2006	2005	2004
Atlantic Bank	7,13%	8,44%	9,69%	8,00%	4,64%	11,92%	9,87%	6,58%	6,89%
Belize Bank Ltd	22,58%	25,81%	27,63%	17,05%	9,37%	5,94%	3,78%	3,63%	2,52%
First Caribbean International Bank	6,35%	7,20%	8,55%	5,28%	2,19%	3,24%	7,24%	10,00%	10,12%
Heritage Bank Ltd	10,44%	21,07%	28,78%	3,79%	19,47%	3,96%	5,32%	5,35%	5,93%
Scotiabank	6,06%	6,50%	5,60%	25,04%	2,62%	2,53%	2,95%	2,79%	2,96%

Note: It corresponds to the third quarter of each year  
Source: Central Bank of Belize

Furthermore, Belize's ratio of non-performing loans to total loans of commercial banks experienced a great increase in 2009 when the economic downturn affected some large group loans. This trend seems to be reversing since mid 2011. Historically, Belize's commercial banks have had a poorer performance (in terms of non-performing loans) than

Barbados, However, last year Belize appeared to have a better performance, even though its ratios are still above the desirable target.

**Table 8. Non performing loans (as a % of total loans) – Belize vs Barbados**

	2012	2011	2010	2009	2008	2007	2006
Belize	10.6%	13.8%	15.7%	11.3%	5.4%	5.7%	5.1%
Barbados	12.1%*	11.1%	10.8%	7.9%	3.5%	2.9%	4.4%

\* first quarter data.

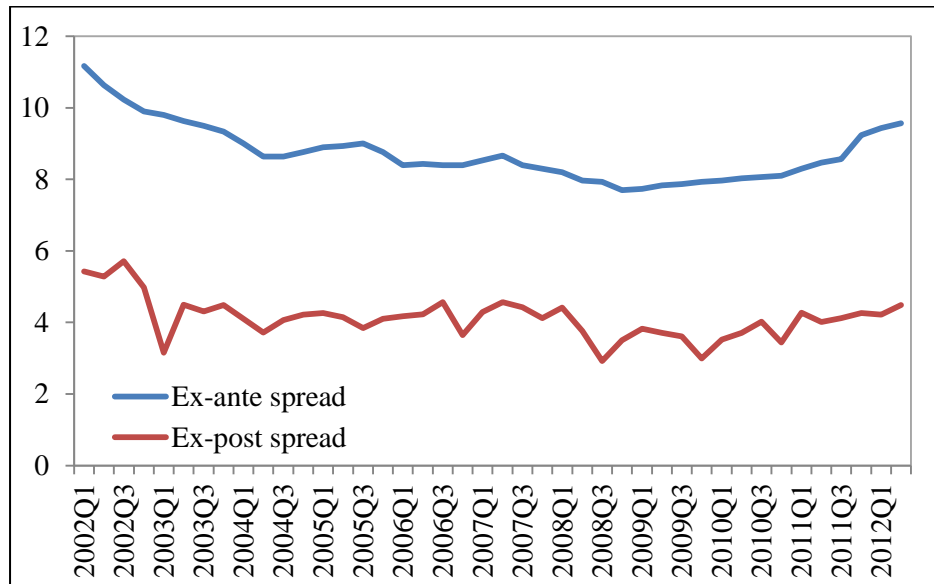
Source: Central Bank of Belize and Central Bank of Barbados.

Nonperforming loans reduced the effective or ex-post interest rate spread, reducing bank profits. The ex-ante interest rate spread is the difference between the contractual rates charged on loans and the rates paid on deposits. These are the rates that the public sees and are easily comparable across banks. The ex-post spread is the difference between the total interest income received on loans and advances (as a ratio of the average stock of loans and advances) and the total interest expense (as a ratio of the average stock of total deposits). Figure 7 shows the difference between average ex-ante and ex-post spreads for Belizean banks. For 2012, the ex-post rate is 53% lower than the ex-ante rate, which implies the difference between both spreads is equivalent to 520 basic points, which is a very large difference.<sup>7</sup> In the last 10 years the difference in the spread has been very constant, between 400 and 500 basic points, what shows this is a structural characteristic of the banking system in Belize.

Demirgüç-Kunt and Huizinga (1999) argue that the ex-post spread is a more encompassing and useful measure because it controls for the fact that banks with high yields and risky credits are likely to face more defaults. In our empirical test for market power we use implicitly the ex-post spreads

<sup>7</sup> There are not many studies computing these spreads in the region; Grenade (2007) studies the Eastern Caribbean countries, finding that the difference between the ex-ante and ex-post spread goes from 230 basic points for Dominica to 60 basic points in Saint Lucia.

**Figure 7. Ex-ante and Ex-post spreads (%)**



Source: Central Bank of Belize.

In the past a combination of several factors attempted against low interest rates, but the reduction of the minimum saving rate has had probably the most important effect, suggesting that currently this was a binding constraint. Low savings does not seem to be a cause of the high saving rate, as once the minimum rate was reduced the saving rate went down to the expected level.

In what follow we focus on interest rate spread behavior. In particular we are interested on the role that non-remunerated reserves have had on spreads and on the degree of competition of this industry in Belize. We study ex-post spread, and therefore they are not affected by nonperforming loans.

#### **4. The Economics of Interest Rate Spread**

The interest rate spread (IRS) is the difference between the lending and the deposit interest rate, and it is a critical component for the financial system. High IRS has been a concern in many developing nations, particularly in small countries, as make credit more expensive

and reduce the profitability of investment affecting growth. A high interest rate spread would be the result of:<sup>8</sup>

- Higher risk of borrowing (the higher spread or profits compensates higher risk)
- Higher costs of borrowing, for instance because of high reserves
- Lack of competition (higher profits for banks)

For small economies, Chand (2002) points out that the first two factors can be further decomposed on:

- scale diseconomies due to small size of markets,
- high fixed and operating costs,
- high transportation costs of funds due to expensive telecommunications,
- existence of regulatory controls, and
- perceived market risks

Regarding the market power of banks (higher profits) Chand (2002) states that in developing economies the local investing alternative for small investors are scarce, as financial markets are very underdeveloped, what reduced the competition for bank deposits. Because of surplus funds, deposit mobilization does not require any serious effort on the part of the banks, and deposit interest rates remains low. According to this argument, lack of competition could depress the deposit rate and therefore the lending rate; therefore, the relevant variable to analyze is the spread more than the level of the interest rate.

A stylized fact of cross country difference in interest rate spread is that the poorer the development of the financial system, the larger the spread. Jayaraman and Sharma (2005) find that developing countries in the Caribbean and the PICs have been experiencing particularly large spreads. The financial sectors of most economies in the Caribbean remain underdeveloped and “thin” because they do not intermediate effectively between savers and investors, Holden and Howell (2009), Randall (1998) examines interest rate spread in Easter Caribbean countries and she finds short-run scale diseconomies in commercial

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<sup>8</sup> There are many works studying the interest rate spread in the literature. One of the first one was Hanson and Rocha (1986) which attributed the high spreads to causes such as high operating costs, financial taxation or repression, lack of competition and high inflation rates.

banking at the aggregate level, with approximately 53 percent of the spread attributable to operation costs. High operating costs (mainly reserve requirements and an implicit return on equity) appear to be the key determinant of observed interest spreads. She argues that a market size expansion of efficient banks might help reduce scale diseconomies and pave the way for greater efficiency.

There are not many studies for Belize analyzing the determinants of the interest rate spread. Perez (2011) is one exception. She examines the components of interest rate spreads in Belize. Using accounting data decomposes the lending rate in the different components for each bank. In addition, she runs regressions with a panel of banks in Belize to identify the determinants of the spread. The study concludes that market share and adversely classified loans are the two main determinants of the spread. Market share is usually associated with the level of competition of an industry and adversely classified loans with the efficiency of the system.

In this line, Mendoza (1997) argues that, in comparison to Barbados economy and despite higher reserve requirement in that country, Belize has high lending rates and interest spreads mainly due to a lower level of competition in the Belizean banking system. Not only Barbados has a larger size commercial banking industry, but a more complex financial system and a wider variety of financing options, thus having a significant level of competition in the financial market.

Martin (2010) argues that Belize's economy has a financial depth consistent with its level of development, with a bias of commercial bank lending towards large, well-established borrowers mainly due to weak creditor rights, asymmetric information and economies of scale in transaction costs. In contrast, credit unions focused on small borrowers, but those institutions are forbidden to borrow more than 20 percent of their lending resources from external sources. He also evidenced the high cost of credit in Belize, strongly connected with constrained credit access. High spread is indicative of inefficient and uncompetitive financial intermediation exacerbating high cost of financing. Cash reserve and liquidity requirements (10 and 23 percent, respectively) constitute an implicit tax on the financial sector. Martin argues that the main challenges in Belize's financial sector are related to lowering high lending interest rates and broadening access to credit.

## 4.1 Factors affecting spreads

As previously described, different explanations have been suggested in the literature on the factors affecting spreads, particularly in emerging markets or low-income countries. In this section, we take into account as many explanatory variables suggested in the literature as we can.

A commonly used definition of margins is the *net interest rate margin (NIM)* measured as the difference between total interest income and interest expenses over total earning assets<sup>9</sup>, all variables are averaged at quarterly frequency to make them comparable to the financial statement data.

### Bank-specific variables

Several bank-specific variables are computed from balance sheet and income statements gathered from the Central Bank of Belize.

- *Size*: larger banks can benefit from economies of scale and incur a lower cost operating at lower margins. To account for bank size, we consider the log of real total assets.
- *Market power*: banks exercising market power may lead to higher margins. The literature suggests different measures of market power within an industry, we calculated four different indicators:
  - ✓ Market share (MS): measures market share in terms of each bank's real total assets.
  - ✓ Market share of loans (MS\_L): measures market share over total loans.
  - ✓ Market share of deposits (MS\_D): measures market share over total deposits.
  - ✓ Herfindahl-Hirschman index (HHI): measures the sum of squares of the market shares (over total assets and total deposits) of all commercial banks in the sector and ranges from 0 to 10,000; it is equal to 10,000 in the case of monopoly or perfect cartel.

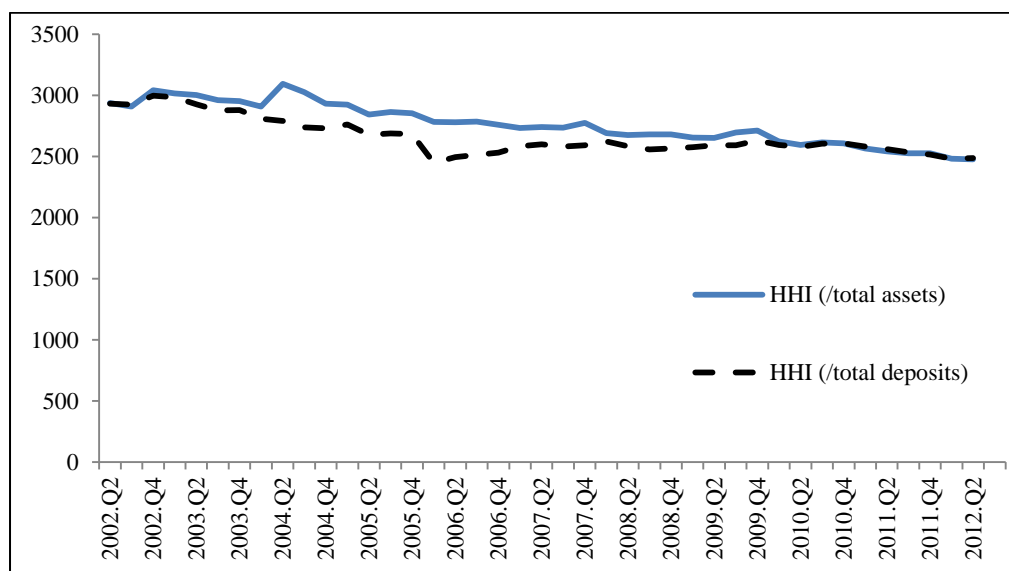
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<sup>9</sup> Total earning assets are comprised by net loans (the difference between total loans and loan loss reserves).



The Herfindahl-Hirschman index (HHI) calculation in Figure 8, allows us to observe the process of economic concentration in Belizean banking sector over the last decade over total assets and deposits.<sup>10</sup>

**Figure 8. Herfindahl-Hirschman Index**



The U.S. Department of Justice and the Federal Trade Commission classify markets as highly concentrated when the HHI is above 2500.<sup>11</sup> Belizean banking sector seems to be moderately concentrated and it showed a smoothed declining trend over last decade. When we include the off-shore banks in the HHI calculation, for the period 2007-2012 the average HHI (over total assets) is reduced from 2629 to 1965.

According to the Central Bank of Belize 2006 Annual Report, three factors explain the reduction of the concentration:

- (i) in 2001, the number of domestic commercial banks increased from four to five;
- (ii) changes in the Offshore Banking Act in 2002 allowed EPZ and CFZ companies to bank with offshore banks licensed in Belize; and
- (iii) higher reserve requirements increased the level of competition among banks and prompted them to compete for market share by offering more attractive rates.

<sup>10</sup> On different measures of industry concentration, see Schmalensee, 1997; Kwoka, 1981.

<sup>11</sup> <http://www.justice.gov/atr/public/guidelines/hmg-2010.html#2d>

- *Efficiency*: we consider two measures of the Efficient-Structure hypotheses to test whether the net interest margin is driven by a greater efficiency. We apply the non-parametric Data Envelopment Analysis (DEA) method to obtain the X-efficiency (ESX) and Scale-efficiency (ESS) proposed by Berger (1995). The ESX hypothesis implies that banks experience lower costs due to managerial efficiency or better technologies, while the ESS is a measure of scale efficiency where banks that produce at more efficient levels than others, have lower unit costs and higher profits. Low efficiency levels are expected to be associated to high interest rate spreads.
- *Liquidity*: there is a trade-off between liquidity and interest rate margins. Banks with higher proportion of liquid assets are likely to generate lower spread. The ratio of liquid assets over total assets is used to proxy liquidity.
- *Liquidity risk*: as a measure of liquidity risk, we consider the ratio of total loans over total assets (LOAA). A positive relationship between LOAA and NIM is expected as the extra costs derived by riskier loans are transferred as lower deposit rates or higher lending rates.
- *Risk aversion*: is measured by the ratio of equity to total assets. The expected sign of risk aversion on the margins is not clear. From one hand, higher risk aversion may lead banks to lend to less-risky activities with low return, resulting in lower margins. In the other hand, well capitalized banks may be perceived as safer by depositors, reducing their funding costs and increasing margins (Poghosyan, 2012).
- *Credit risk*: is measured by the ratio of loan loss provisions to net loans. Higher credit risk will lead to higher spreads required by the bank to finance that project.
- *Adversely classified loans*: this variable is directly gathered from balance sheet and income statements. A higher ratio of adversely classified loans is associated with higher margins.
- *Operating costs*: are measured by the ratio of non-interest expenses to total assets. Less efficient banks, incurring larger operating costs, are expected to increase their margins. For the aggregate system, on average, the operating costs as a ratio to total assets is at 6.8 per cent for the analyzed period. According to Moore and Craigwell (2000), international standards normally identify 3.6 per cent as an average and Grenade (2007) recorded ratios ranging from 3.0 per cent in St. Kitts and Nevis to 4.7 per cent in

Antigua and Barbuda. This suggests that Belize's commercial banks operate with relatively high intermediation costs.

- *Quality bank loan portfolio*: the level of loan loss reserves (LLR) is a proxy for the quality of the bank loan portfolio. An increase in loan loss provisions may increase interest rate spreads as banks charge to customers an extra premium for poor loan quality. However, higher loan loss provisions may lead to lower spreads if fewer resources are allocated to alternative investment opportunities.
- *Capitalization*: the degree of capitalization of each bank is measured as equity over assets. Higher ratios are associated with higher spreads, as they would need to offset higher costs driven by a greater capitalization.

### **Institutional variables**

Several studies highlighted the importance of legal frameworks, governance and property rights (Demirgüç-Kunt, *et al.* 2004). As in Poghosyan (2012), we considered various proxies of institutional development. These time-varying indices were retrieved from the World Governance Indicators, i. e. Kaufman *et al.* (2002):

- *Rule of law*: this index captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. A higher index value will imply a lower interest rate spread.
- *Control of corruption*: this index captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. A higher index value is associated with a lower interest rate spread as there will be a better governance environment.
- *Regulatory quality*: this index captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Again, a higher index value indicates an improvement in regulatory quality and this is likely to generate lower spreads.

### **Regulatory variables**

Commercial banks are required to maintain certain percentage of total deposits and other liabilities. This percentage has changed over the years and in many cases, banks hold liquid assets beyond the legal requirement.

- *Cash reserve requirements*: this time-varying variable measures the percentage of cash reserve requirements in Belize. This type of regulation implies a tax on banks as they are usually not remunerated or remunerated at low rates, and thus they will pass on this tax to their customers by increasing margins.
- *Holding requirements*: as in Perez (2011), this variable measures the actual holdings of liquid assets (liquid assets legal requirement plus excess –shortfall– of statutory liquid assets) as a ratio to liquid assets. Higher holdings to holding requirements should increase spreads.

### **Macroeconomic variables**

- *Inflation*: a greater inflation, measured by the average change of the consumer price index, will imply a higher risk of default, and thus banks will charge a risk premium into lending rates, thus increasing interest rate spreads.
- *Economic growth*: economic growth (real growth of the gross domestic product in US dollars) has a wealth effect reducing interest rate spreads.

## **4.2 Data and econometric modeling**

The data was collected from balance sheets and financial statements published by the Central Bank of Belize and from the Statistics Institute of Belize for the period between the second quarter of 2002 and the fourth quarter of 2012. This data corresponds to commercial banks, the main focus our analysis. Table 9 provides descriptive statistics of interest margins and their determinants.

**Table 9. Descriptive statistics**

Variables	Mean	Std. Dev.	Min	Max
Net interest margin (%)	2.09	0.16	-0.04	4.46
Size (MM BZ\$)	279.04	43.60	70.76	662.22
Market share (%)	20.00	3.08	6.53	49.05
Market share of loans (%)	20.00	3.35	5.99	50.21
Market share of deposits (%)	19.93	2.55	5.11	57.68
HHI (index)	2,755.85	170.15	2,465.53	3,094.61
ESX	0.75	0.04	0.42	1.00
ESS	0.87	0.03	0.65	1.00
Liquidity (%)	20.90	1.88	7.81	48.19
Liquidity risk (MM BZ\$)	8.88	2.66	0.55	75.91
Risk aversion (%)	12.67	1.23	4.82	26.32
Credit risk (%)	3.48	0.65	1.09	15.23
Adversely classified loans (%)	7.97	1.77	1.42	31.46
Operating costs (%)	6.71	0.41	3.56	10.67
Quality bank loan portfolio (%)	70.06	1.99	39.59	81.95
Capitalization (%)	12.67	1.21	4.82	26.32
Rule of law, index	-0.23	0.16	-0.50	0.05
Control of corruption, index	-0.24	0.11	-0.39	-0.04
Regulatory quality, index	-0.32	0.21	-0.54	0.05
Cash reserve requirements (%)	8.19	0.47	3.00	10.00
Holding requirement (%)	127.91	9.95	19.61	342.55
Real GDP growth (%), quarterly*	1.18	4.10	-9.95	12.01
Inflation (%), quarterly*	0.61	1.05	-2.65	3.05

Note: BZ\$ indicates Belizean dollar. All figures are calculated at the market level. \* indicates data reported until 2012Q3.

We used a balanced panel data of Belize's commercial banks to explain net interest margins on bank-specific, institutional, regulatory and macroeconomic variables:

$$NIM_{it} = \alpha_0 + C_i + \sum_{i=1}^{10} \beta_i B_{it} + \sum_{i=1}^3 \gamma_i I_t + \sum_{i=1}^2 \eta_i R_{it} + \sum_{i=1}^2 \delta_i M_t + \phi NIM_{it-4} + \varepsilon_{it} \quad (1)$$

where  $i$  and  $t$  indices stand for bank and time, respectively.  $NIM$  is the net interest margin explained by bank-specific ( $B$ ), institutional ( $I$ ), regulatory ( $R$ ) and macroeconomic ( $M$ )

factors. We included dummy variables to allow the intercept term to vary across banks and over time, thus capturing individual bank and time heterogeneity; and  $\varepsilon_{it}$  is an i.i.d. random error.

The relation of market power, efficiency and performance in banking sector is explained by two competing hypotheses: Structure Conduct Performance (SCP) Hypothesis and Efficient Structure (EFS) Hypothesis. The main difference between both theories is the spreads. SCP predicts high spread, whereas EFS predicts low spreads, particularly for the most efficient banks.

SCP hypothesis postulates that in a concentrated market, the higher is the market power and therefore the higher the profits (Bain, 1951), through lower price of deposit and higher price of credit (Park & Weber, 2006). Concentration causes market power and profits; and spreads would be high.

The EFS hypothesis (Demsetz, 1973), postulates that the more efficient banks would be more profitable at the time they can pay higher deposit rates or offer cheaper loans. This means that more efficient banks would have a larger market share, and the industry would be more concentrated. This hypothesis postulates that there is a positive correlation between concentration and profit of an efficient bank, which is not associated with market power. The EFS hypothesis is usually broken into two components: X-efficiency (ESX) and scale efficiency (ESS), which are here derived from the estimation of a stochastic frontier approach (as described in Section 6).

There are considerable number of studies conducted to test whether SCP or EFS hypothesis could explain the relation between market power, efficiency and performance of bank in several countries and regions. Following Ardianty and Viverita (2011), we then test the existence of the SCP and EFS hypothesis using the coefficients of a profitability equation,

$$ROAE_{it} = \beta_0 + \beta_1 HHI_t + \beta_2 MS_{it} + \beta_3 EFF_{it} + \beta_4 Z_{it} + e_{it} \quad (1)$$

where  $ROAE$  is the annualized return on average equity of bank  $i$  at time  $t$ ,  $HHI$  is the Herfindahl-Hirschman Index,  $MS$  is the market share,  $EFF$  is the technical efficiency and  $Z$  is a vector of control variables. As in Ardianty and Viverita (2011), to test the existence of the SCP

and EFS hypothesis in the Belizean banking sector, we use model (a) and (b) below,

$$\frac{\partial ROAE}{\partial HHI} > 0; \frac{\partial ROAE}{\partial MS} > 0; \frac{\partial ROAE}{\partial EFF} = 0 \quad (a)$$

$$\frac{\partial ROAE}{\partial HHI} = 0; \frac{\partial ROAE}{\partial MS} = 0; \frac{\partial ROAE}{\partial EFF} > 0 \quad (b)$$

If (a) is the case, the SCP hypothesis is accepted. However, if (b) come forth, then the EFS hypothesis is accepted.

### 4.3 Empirical results

Equation (1) is estimated by two-step GMM to account for dynamic bias (see Table 10). A panel fixed effects (FE) estimation is also conducted, as dynamic bias diminishes with large T (see Judson and Owen, 1999), obtaining similar results. White cross-section standard errors and covariance are considered.

**Table 10. GMM and FE regressions (NIM as dependent variable)**

Variable	GMM (1)	FE (2)
Constant	0.003 (0.007)	0.002 (0.004)
NIM(-4)	0.243*** (0.069)	0.241*** (0.066)
ESX	-0.002 (0.005)	-0.001 (0.002)
ESS	-0.005 (0.009)	-0.002 (0.005)
Market Share	0.079*** (0.017)	0.072*** (0.014)
Credit Risk	0.068*** (0.017)	0.055*** (0.012)
2005Q3	0.003*** (0.001)	0.003*** (0.001)
2006Q1	0.003*** (0.001)	0.003*** (0.001)
2006Q4	0.004*** (0.001)	0.004*** (0.001)
2010Q2	-0.002*** (0.000)	-0.003*** (0.000)
Adj. R <sup>2</sup>	0.61	0.61

*Notes: \*\*\*, \*\*, \* indicates significance at the 1%, 5% and 10% level, respectively. Standard errors are reported in parentheses. The lagged dependent variable accounts for dynamics when using quarterly data. The set of dummies included corresponds to the main changes in the level of cash reserve requirements*

From the estimation of the net interest margin we found a positive and statistically significant relationship between market power (proxied by bank's market share) and spread, as the SCP hypothesis states. The efficiency-structure hypothesis predicts a negative relationship between interest margins and both efficiency measures as it was found (although not statistically significant) in our regressions.

Table 10 also shows that the lagged NIM variable is positive and statistically significant suggesting a degree of persistence of the net interest margin in Belize. Our findings suggest that the SCP hypothesis holds for Belizean banking sector, while the EFS hypothesis seems not be significant. Perez (2011) also finds evidence on market share as one of the significant factors which have a positive impact on interest rate spreads, apart from adversely classified loans and holdings requirements above required levels.. Therefore, the role of competition and efficiency should be together analyzed as greater efficiency may increase both profits and market share, thus resulting in a spurious relationship. Although not significant, the managerial or technical efficiency score (ESX) as well as the scale-efficiency score (ESS) have a negative coefficient, indicating that more efficient commercial banks in Belize tend to have lower interest rate spreads..

Credit risk, measured as the ratio of loan loss provisions to net loans, has also a significant effect on NIM. Those banks with riskier lending portfolio are required to transfer a larger amount of funds to maintain adequate loan loss provision reserves, resulting on higher spreads.

In the period we study, there were several policy changes in the level of cash reserve requirements (CRR). To account for these discrete changes we included a set of dummies. All the dummies included are statistically significant, showing that there is a direct and positive relationship between reserve requirement and the spread. In May 2005, CRR increased from 7% to 8% and later was raised to 9% and 10% in January and September 2006, respectively. All the dummies for these successive increments in CCR are positive and significant, what show the spread has increased responding to CCR increases (as CCR



are not remunerated). In the period analyzed we have only one reduction, in 2010 (the CRR was reduced from 10% to 8.5%) what explains why the coefficient of the dummy 2010Q2 is negative. The is simple: if a proportion of assets backing a deposit liability has to be held as non–interest bearing balances at the central bank, then the average interest rate charged by the bank on its other assets must be correspondingly higher than the average rate paid on its deposits. We find evidence that this is the case. The imposition of CRR will mean that deposit rates are lower than they otherwise would have been, or lending rates higher, or both. In the case of Belize, as there is a minimum saving rate, all the effect of CRR will be passed through to borrowers.<sup>12</sup>

The individual effect of each policy change in CRR and its effect on the average spread (conditional on the other explanatory variables, that is efficiency, market power and credit risk variables), is shown in the next table. Results show that the relationship is nonlinear. A similar increase in the CRR shows higher effects on NIM as the higher is the initial level of CRR and NIM. On the other hand, the reduction of the CRR in 2010 did not have the same effect that the last increase in 2006, and the main difference is the initial level of NIM when the policy was implemented (in 2006 was 2.56% in 2010 was 1.86%).

**Table 11. The effect of changes in CRR on the spread**

<b>Period</b>	<b>CRR</b>	<b>ΔCRR (1)</b>	<b>NIM</b>	<b>OLS Coeff. (2)</b>	<b>ΔNIM (3)</b>	<b>ΔNIM/ NIM</b>	<b>Arc Elasticity (4)</b>
2005Q3	From 7% to 8%	1%	2.36%	0.30%	0.07%	0.03	0.21
2006Q1	From 8% to 9%	1%	2.40%	0.27%	0.15%	0.06	0.50
2006Q4	From 9% to 10%	1%	2.59%	0.45%	0.31%	0.12	1.08
2010Q2	From 10% to 8.5%	-1.5%	1.86%	-0.25%	0.19%	0.10	0.68

<sup>12</sup> If higher CRR leads to higher lending rates, the monetary policy stance is clearly tightened. If some of the impact is passed through to deposit rates, it is not so obvious that lower deposit rates represent a monetary policy tightening. Minimum savings rates are imposed to avoid the pass through. It is also important to remind that CRR might have an uneven impact, if some financial institutions are not subject to the obligation (changes in official interest rates are supposed to be better on this, as it pass through more predictably to all financial markets, Gray (2011)). On the other hand, CRR has the potential advantage of allowing the Central Bank to tighten monetary policy without encouraging short–term capital inflows (as it is usually the case with increases in interest rates) – CRR is less effective in discouraging capital inflows if those inflows are not intermediated by banks, as it is the case with remittances.

Notes: (1)  $\Delta CRR$  represents the difference in the CRR from one quarter to the other. (2) it represents the difference in the NIM with respect to the average NIM. (3)  $\Delta NIM$  recalibrates the OLS coefficient to represent the estimated effect on NIM from one quarter to the other. (4)  $(\Delta NIM/NIM) / (\Delta CRR/CRR)$ .

To sum up, high margins in Belize seem to be symptomatic of lack of competition, technical inefficiency, credit risk and regulatory constraints such as changes in the level of cash reserve requirements.

We expect that banks with higher net interest rates will generate higher profit. Therefore, Table 12 presents the results from the estimation of the *RAOE* equation (equation (2)) to see which hypothesis is accepted: the SCP or EFS and to analyze the relationship between market power, efficiency and performance in the banking sector. The *RAOE* is a complete measurement that also includes *ROA* and *NIM* and thus represents a better proxy of bank's profitability.

**Table 12. FE estimation of ROAE**

Variable	FE
Constant	-1.712*** (0.333)
EFF	-0.161 (0.161)
Market Share	1.683*** (0.473)
HHI (/1000)	0.681*** (0.103)
Operating costs	-3.262** (1.658)
Adj. R <sup>2</sup>	0.39

Notes: \*\*\*, \*\*, \* indicates significance at the 1%, 5% and 10% level, respectively. Standard errors are reported in parentheses. White cross-section standard errors were considered.

Our results show that concentration (*HHI*) and market share (*MS*) are statistically significant and positive suggesting that bank's profitability increases as the market becomes more concentrated. Banks with market power can create high spread (Table 10) and thus generate more profits (Table 12). However, the EFS hypothesis seems not to describe the impact of inefficiency on banks performance in Belize.

There is, nevertheless, a relationship between both theories, as Berger & Hannan (1998) points out. In higher concentrated market, banks that have higher market share and higher market power tend to operate inefficiently. With market power, the incentive to be efficient is lower, because efficiency costs can be passed through to customers. This condition is called the ‘quiet life’ condition (adapted from the phrase used by Hicks, 1935).

## 5. Assessing market power in the Belizean banking sector

Given that market power was suggested by numerous studies as the main determinant of high interest spreads, it is necessary to empirically determine whether commercial banks exert market power in the Belizean banking sector. Belize offers an attractive scope for evaluating market power. During the last decade, the interest rate spread (lending rate minus deposit rate) has been approximately 7%<sup>13</sup> and even if the Government has tried different policy options to avoid binding constraint, such as lower cash reserve requirements, spreads remain considerably high.

An important distinction of the case of Belize is the mandatory non-remunerated reserves, because it forces the banks to have costly deposits liquid, reducing loans, and forcing banks to increase the cost of lending to compensate for the liquid funds. If this aspect is not taken into account, commercial banks spreads might look high, leading the evidence to market power. We adapt the standard methodology for measuring market power to this specific feature of Belize to have more robust conclusions.

### 5.1 Methodology

There are different approaches in the literature to determine whether a firm is exercising market power in an industry (see Perloff *et al.*, 2007). This has long concerned new empirical industrial organization (NEIO) economists who try to test conduct by directly addressing firm’s behavior. This can be done in two ways. The first is to estimate market

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<sup>13</sup> Source: World Bank – World Development Indicators Database

power as a free parameter using a conduct-parameter (CP) approach based on the earlier literature of Appelbaum (1979, 1982), Bresnahan (1982) and Lau (1982). Alternatively, the so-called “*H*-statistic” competition model based on Panzar and Rosse’s (1977, 1978) approach can be used. In this paper, we compare these two widely used non-structural models for assessing market power in the Belizean banking sector.

### *Conduct-parameter approach*

This approach has the advantage of providing a direct estimate of market power and it avoids indirect inferences about market power based on different concentration indices. ON the other hand, it requires detailed information on bank’s costs and demand. Applications of this methodology in the banking industry have been performed by Shaffer (1989, 1993), Toolsema (2002), Angelini and Cetorelli (2003), Sjöberg (2008), Delis *et al.* (2008), among others.

Belizean banking sector consists of 5 commercial banks for the analyzed period. Each bank faces the following market demand function:

$$\ln Q_t = \alpha_0 + \alpha_1 \ln P_t + \alpha_2 \ln Y_t + \alpha_3 \ln Z_t + \text{seasonal dummies} + \varepsilon_t \quad (3)$$

where  $Q_t = \sum_{i=1}^5 q_{it}$  is the quantity produced by the industry at the market price  $P$ .  $Y$  and  $Z$  are exogenous demand shifters, and  $\varepsilon$  is the error term. The level of gross domestic output is used as a proxy of the income variable ( $Y$ ) and the Treasury bill, as the price of a substitute for banking services ( $Z$ ). Seasonal effects were accounted for with the use of quarterly dummy variables. For further definitions on these variables see Table 13.

We consider a flexible functional form for the cost function: the translog cost function. This specification is commonly used in the analysis of banking markets (see Angelini and Cetorelli, 2003; Sjöberg, 2007, Coccoresse, 2009) and is useful specially when dealing with scale and scope economies in multi-product firms.

$$\begin{aligned} \ln C_{it} = & \beta_0 + \beta_1 \ln q_{it} + \frac{\beta_2}{2} (\ln q_{it})^2 + \beta_3 \ln w_{1,it} + \beta_4 \ln w_{2,it} + \beta_5 (\ln w_{1,it})^2 + \beta_6 (\ln w_{2,it})^2 \\ & + \beta_7 \ln q_{it} \ln w_{1,it} + \beta_8 \ln q_{it} \ln w_{2,it} + \beta_7 \ln w_{1,it} \ln w_{2,it} + \beta_8 \text{trend} + u_{it} \end{aligned} \quad (4)$$

Where  $C$  is the total cost,  $w_1$  and  $w_2$  are factor prices and  $u$  is an error term. The time trend captures technological changes or financial innovations such as changes in reserve requirements. In Belize, cash reserve requirements have been lowered over the years. The translog function allows us to avoid the test for symmetry, but we also impose the usual conditions on its coefficients, that is, linear homogeneity in input prices implying the restrictions  $\beta_3 + \beta_4 = 1$ ,  $\beta_5 + \beta_6 = 0$  and  $\beta_7 = 0$ .

By assuming a profit-maximizing behavior, and as total revenue would be  $TR_{it} = p_{it} \cdot q_{it}$ , the equilibrium condition will imply that the marginal revenue equals the marginal cost, that is:

$$p_{it} + \frac{P_t}{\alpha_1} \frac{q_{it}}{Q_t} = \frac{C_{it}}{q_{it}} (\beta_1 + \beta_2 \ln q_{it} + \beta_5 \ln w_{1,it} + \beta_6 \ln w_{2,it})$$

Re-arranging the previous equation,

$$p_{it} = \gamma_1 \frac{C_{it}}{q_{it}} + \gamma_2 \frac{C_{it}}{q_{it}} \ln q_{it} + \gamma_3 \frac{C_{it}}{q_{it}} \ln w_{1,it} + \gamma_4 \frac{C_{it}}{q_{it}} \ln w_{2,it} - \lambda \left( \frac{P_t}{\alpha_1} \right) + \xi_{it} \quad (5)$$

Equation (5) represents the inverted residual supply curve, where  $\xi_{it}$  is the error term and  $\lambda = q_{it} / Q_t$  is a measure of the bank's market power, as the ratio of the amount offered by the  $i$ th bank relative to the market's production. It represents the conjectural variation coefficient of the NEIO literature. So,  $\lambda$  is a new parameter that can be interpreted as a statistic that measures the degree of market power. Under conditions of perfect competition,  $\lambda = 0$  and price equals marginal cost. When  $\lambda = 1$  we face a perfect cartel, and when  $0 < \lambda < 1$  different oligopoly regimes apply.

As some of the same parameters of the demand equation enter in the supply relation function, the system of equations has cross-equation constraints. Since equation (4) is intrinsically nonlinear in its parameters, the market structure model represents a nonlinear simultaneous equation system. Thus, the simultaneous equation model comprised by the demand equation (3), the cost equation (4) and the supply relation (5) is estimated using iterative nonlinear three-stage least squares (N3SLS) to address the endogeneity problem. Furthermore, in order to capture bank-specific effects, dummy variables for each bank were included.

### *Panzar-Rosse H-statistic*

The Panzar and Rosse model has fewer data requirements than the CP approach. Using bank-level data, this model relies on the premise that banks will have different pricing strategy to changes in factor input prices, depending on the market structure in which the banks operate. Therefore one can infer from the revenues earned whether a bank operates in a competitive market or has some market power.

Therefore, the “*H*-statistic” is a measure of the competitiveness, defined as the sum of the elasticities of the reduced forms revenue with respect to input prices (unit price of funds, capital and labor). If the *H*-statistic is less than zero, there is monopoly evidence; an upward shift in the marginal cost curve is associated with a reduction in revenue. If the *H*-statistic is equal to one, the market structure is characterized as perfectly competitive as any increase in input prices should lead to a proportional increase in total revenues. Finally, if it lies between zero (inclusive) and one (exclusive), the market structure is characterized by monopolistic competition, as revenues will increase less than proportionally to changes in input prices.

Many empirical studies followed this approach to assess market power in the banking industry (see Molyneux *et al.*, 1994 for the European banking; Hondroyiannis *et al.*, 1999 for the Greek banking system; Claessens and Laeven, 2004 for international evidence; Gelos and Roldós, 2004 for European and Latin American countries; Delis *et al.*, 2008 for the Greek, Latvian and Spanish banks). However, there is little empirical research on the Caribbean region (see Ganga, 2010 for Guyanese case).

In this paper, we estimated the following bank revenue equation in which revenue is explained by factor prices and other bank specific prices,

$$\ln TR_{it} = \alpha + C_i + \beta_1 \ln w_{1,it} + \beta_2 \ln w_{2,it} + \beta_3 \ln TA_{it} + \beta_4 \ln NLTA_{it} + \beta_5 \ln CRR + \varepsilon_{it} \quad (6)$$

where  $t=1, \dots, T$  indicates time (quarter) and  $i=1, \dots, 5$  indicates bank. *TR* stands for a bank’s real total revenue,  $w_1$  and  $w_2$  are the input prices: interest expenses over intermediate funds (demand deposits + saving deposits + time deposits) and non-interest expenses over total assets, respectively. As control variables, we included real total assets (*TA*) and the ratio of

net loans to total asset (*TLTA*) as proxies of size and cash reserve requirements (*CRR*) that will negatively affect total revenues. Bank-specific dummies were also included to account for individual effects not directly observed.

### *The effect of non-remunerated reserves*

Non-remunerated reserves force commercial banks to freeze deposit losing the income they can obtain lending these resources (opportunity cost). In a competitive industry, this is like an increment in the marginal cost, what would force prices (lending interest rates) up, as increments in marginal cost are fully passed through to consumers. In a non-competitive industry, banks have market power to set prices, what means the pass-through would depend on the relative demand and supply elasticities.

We have to take this effect into account in our estimations. In addition, changes in reserves are exogenous changes that would help to identify market power as well (it is a good instrumental variable).

Here we will discuss the effect of non-remunerated reserves on market power test and we will propose an adaptation of the model to this particular case, to have a more refined test of market power.

## **5.2 Data description**

Both panel data models are estimated using quarterly series over an eleventh-year period spanning from the second quarter of 2002 to the second quarter of 2012 on the five Belizean commercial banks, a total of 205 observations.

All bank-level data was taken from the Quarterly Financial Information of Commercial Banks published by the Central Bank of Belize, which have a detailed summary of the commercial banks balance sheets and income statements.

Macroeconomic data such as the gross domestic product and the Treasury bill rate was also gathered from the Central Bank of Belize, while the consumer price index was taken from the Statistical Institute of Belize.

The output variable in the CP approach ( $Q$  when referring to the industry's total output, and  $q$  when referring to the individual commercial bank's output) is defined as the value of total assets in real terms (deflated by Belizean consumer price index),  $Q$  is measured as the sum of each bank's  $q$ . The unit price of output (namely  $P$  at the market level, and  $p$  at the bank level) is measured as interest income over total assets;  $P$  is measured as the simple average of  $p$ . For the demand equation, the gross domestic product at constant prices is used as proxy for general economic activity ( $Y$ ), and the Treasury bill rate, for the price of a substitute to the services offered by the commercial bank ( $Z$ ).

Following the intermediate approach that is, considering banks as financial intermediaries using three variable inputs: deposits, labor and physical capital, total costs ( $C$ ) includes interest and non-interest expenses (expressed in real terms). The unit prices of inputs are defined as follows:

- Input cost of funds ( $w_1$ ): ratio of interest expenses to total intermediated funds (demand deposits, saving deposits and time deposits).
- Input cost of labor and physical capital ( $w_2$ ): ratio of non-interest expenses to fixed assets.

We were not able to separate personal expenses from administrative expenses, as they are jointly reported as 'non-interest expenses' in the bank's balance sheets. Nevertheless, the coefficient on administrative expenses is in most cases negative though insignificant, providing evidence of excess capacity in the banking systems (see Hondroyannis *et al.*, 1999; Delis *et al.*, 2008). Finally, regarding the Panzar-Rosse H-statistic approach, the real interest income is used as proxy of the real total revenue ( $TR$ ) and the ratio of net loans to total asset ( $NLTA$ ) as a risk variable.

In Table 13 we report banking indicators of the variables previously described for the period 2002-2012.



**Table 13. Summary Statistics for Belizean Banking Sector 2002Q2-2012Q2**

Variable	Symbol	Mean	Std. Dev.	Min.	Max.
Real total assets (MM BZ\$)	<i>Q</i>	1409.35	293.67	990.56	2123.45
Interest income / total assets (%)	<i>P</i>	10.00	0.98	7.52	11.69
Real gross domestic product (MM BZ\$)	<i>Y</i>	570.47	56.37	459.60	704.60
Treasury bill rate (%)	<i>Z</i>	3.04	0.34	2.13	3.47
Real total costs (MM BZ\$)	<i>C</i>	25.29	3.36	6.24	65.69
Input cost of funds (%)	<i>w<sub>1</sub></i>	5.60	1.84	1.07	12.49
Input cost of labor and physical capital (%)	<i>w<sub>2</sub></i>	17.14	5.86	5.57	34.83
Real total revenue (MM BZ\$)	<i>TR</i>	28.11	4.54	5.10	66.97
Net loans / total assets	<i>NLTA</i>	0.62	0.10	0.38	0.77
Cash reserve requirements (%)	<i>CRR</i>	8.19	0.47	3.00	10.00

Note: BZ\$ indicates Belizean dollar. All figures are calculated at the market level.

By 2011, the total assets for the commercial banks amounted to \$2.6b. Commercial banks accounted for 68.4% of total assets in the financial sector, which is also comprised by offshore banks, credit unions, insurance companies, financial institutions and a development bank. Only two banks in the commercial banking sector hold 67% of the loans and 61% of the deposits.

### 5.3 Results

In this section, Tables 14 and 15 present the empirical results of the market power's assessment in the Belizean banking sector through the conduct-parameter approach and the Panzar-Rosse *H*-statistic.

#### *Conduct-parameter approach*

To account for the effect of non-remunerated reserves, we adapted the model to have a more refined test of market power. As the observed interest rate in the market already incorporates the effect of non-remunerated reserves, it is necessary to discount their effects and get a 'cleaned' estimate of market power. Therefore, the cost equation (4) and the equilibrium relation (4) should be reparametrized as follows,

$$\ln C_{it} = \beta_0 + \beta_1 \ln q_{it}^* + \frac{\beta_2}{2} (\ln q_{it}^*)^2 + \beta_3 \ln w_{1,it} + \beta_4 \ln w_{2,it} + \beta_5 (\ln w_{1,it})^2 + \beta_6 (\ln w_{2,it})^2 + \beta_7 \ln q_{it}^* \ln w_{1,it} + \beta_8 \ln q_{it}^* \ln w_{2,it} + \beta_7 \ln w_{1,it} \ln w_{2,it} + \beta_8 trend + u_{it} \quad (4')$$

where  $q_{it}^* = q_{it}(1 - CRR_t)$  is the new output level, which is lower than  $q_{it}$  as the amount of output that can be used to lending activities is reduced by a factor of  $(1 - CRR_t)$ , the percentage of output not affected by CRR.

$$p_{it}^* = \gamma_1 \frac{C_{it}}{q_{it}^*} + \gamma_2 \frac{C_{it}}{q_{it}^*} \ln q_{it}^* + \gamma_3 \frac{C_{it}}{q_{it}^*} \ln w_{1,it} + \gamma_4 \frac{C_{it}}{q_{it}^*} \ln w_{2,it} - \lambda \left( \frac{P_t}{\alpha_1} \right) + \xi_{it} \quad (5')$$

where  $p_{it}^* = p_{it}(1 - CRR_t)$ . That is, when discounting the effect of cash-reserve requirements, we get a 'new price' ( $p^*$ ) which represents a lower interest rate.

Table 14 shows the nonlinear 3SLS system of equations (3), (4/4') and (5/5') estimation considering cash-reserve requirements (CRR) and discounting their effects (No CRR).

**Table 14. Nonlinear Simultaneous Equation System Estimation**

Variable	Parameter	CRR (2)-(3)-(4)	No CRR (2)-(3')-(4')
<i>(1) Demand equation (dependent variable: lnQ)</i>			
constant	$\alpha_0$	4.88***	4.89***
lnP	$\alpha_1$	-0.51***	-0.52***
lnY	$\alpha_2$	1.65***	1.65***
lnZ	$\alpha_3$	-0.02	-0.02
season(1)	$\alpha_4$	-0.05***	-0.06***
season(2)	$\alpha_5$	-0.03***	-0.03***
season(3)	$\alpha_6$	-0.02	-0.02
Adj. R <sup>2</sup>		0.90	0.90
<i>(2) Cost equation (dependent variable: lnC)</i>			
constant	$\beta_0$	-22.41***	-24.54***
lnq	$\beta_1$	4.57***	4.95***
(lnq) <sup>2</sup>	$\beta_2$	-0.30***	-0.33***
lnw <sub>1</sub>	$\beta_3$	-0.56	-0.66
lnw <sub>2</sub>	$\beta_4$	1.37***	1.47***
(lnw <sub>1</sub> ) <sup>2</sup>	$\beta_5$	0.01	0.01
(lnw <sub>2</sub> ) <sup>2</sup>	$\beta_6$	0.05	0.03
lnq.lnw <sub>1</sub>	$\beta_7$	0.07**	0.08**
lnq.lnw <sub>2</sub>	$\beta_8$	-0.09**	-0.10***
lnw <sub>1</sub> .lnw <sub>2</sub>	$\beta_9$	-0.09*	-0.09*
trend	$\beta_{10}$	0.004***	0.004***
Adj. R <sup>2</sup>		0.98	0.98

(3) Supply relation (dependent variable: $p$ )			
$C/q$	$\gamma_1$	21.99	-21.71
$C/q.\ln q$	$\gamma_2$	10.06*	12.32**
$C/q.\ln w_1$	$\gamma_3$	69.52***	60.43***
$C/q.\ln w_2$	$\gamma_4$	60.34***	52.15***
market power	$\lambda$	0.46***	0.44***
Adj. $R^2$		0.43	0.44
$H_0: \lambda = 1$	$\chi^2(1)$	13.03***	15.68***

Note: \*, \*\*, \*\*\* indicate significance at the 10%, 5% and 1% level, respectively. Instruments: lagged  $q$ ,  $p$  and  $C$  (logs, levels); current and lagged  $w_1$ ,  $w_2$  and cross-products (logs); current  $Y$  and  $Z$  (logs); individual dummies. The coefficients of the bank dummies are not reported owing to space considerations. Instead the Wald test ( $\chi^2(5)=76.18$ , p-value=0.00 and  $\chi^2(5)=77.36$ , p-value=0.00, respectively) indicates that the bank-specific effects are jointly significant.

In both estimations, almost all parameters in the demand equation were found to be statistically significant, with exception of the Treasury bill ( $Z$ ) as a proxy for the price of a substitute to the services offered by the commercial bank, implying that the Treasury bill is an imperfect substitute. The negative coefficient of the ratio of interest income to total assets ( $P$ ) suggests that the demand function decreases as the interest rate increases, as expected. The income elasticity of 1.65 indicates that credits behave as normal goods. Then, as income raises more credit is demanded at each interest rate level.

As regards the cost function, most coefficients are highly significant. The estimated values indicate that an increase in the price of labor and physical capital drives costs up. In average, the conduct parameter over the analyzed period is at 0.46 and significantly different from zero and the unity. These results suggest that certain degree of market power is exerted by commercial banks, Belizean banking sector is imperfectly competitive. Furthermore, when we discount the effect of non-remunerated reserves, market power estimation is slightly reduced to 0.44. This finding implies that in the existence of cash reserve requirement, banks have lower proportion of funds allocated to loans and a higher interest rate (as this new 'price' is affected by non-remunerated reserves), resulting on a higher mark up which is actually appropriated by the government.

*Panzar-Rosse H-statistic*

The  $H$ -statistic is also estimated to corroborate if there is low degree of competition in Belizean banking sector. Equation (6) is estimated using a panel-data fixed-effects estimator as shown in Table 15. We considered two specifications, column (1) estimates Panzar-Rosse model without cash reserve requirements (*No CRR*) as explanatory variable, while column (2) presents the estimation that includes *CRR*.

Both estimation show that the coefficients on  $w_1$  and  $w_2$  are positive and statistically significant, except for the unit price of funds in the estimation that excludes the effect of cash reserve requirement. Therefore, personnel and capital costs as well as the cost of funds have a positive contribution to total revenues. Control variables are also significant. The positive effect of real total assets ( $TA$ ) as a proxy of size indicates strong economies of scale, size differentials in assets among banks leads to higher revenues. The other scale variable, the ratio of net loans to total assets ( $NLTA$ ) suggests that the higher the proportion of loans on banks portfolio, the higher the revenues. The negative coefficient of cash reserve requirement ( $CRR$ ) indicates that this type of regulation, which implies a tax on Belizean banks as they are not remunerated, leads to lower total revenues.

**Table 15. Panzar-Rosse H-Statistic Estimation**

Variable	Parameter	No CRR (1)	CRR (2)
Constant	$\alpha$	-8.55 *** (0.78)	-9.31 *** (0.85)
unit price of funds ( $w_1$ )	$\beta_1$	0.04 (0.03)	0.07 ** (0.04)
unit price of labor and physical capital ( $w_2$ )	$\beta_2$	0.09 * (0.05)	0.13 *** (0.05)
total assets ( $TA$ )	$\beta_3$	1.04 *** (0.04)	1.12 *** (0.05)
net loans / total asset ( $NLTA$ )	$\beta_4$	1.02 *** (0.11)	1.01 *** (0.11)
cash reserve requirements ( $CRR$ )	$\beta_5$		-0.10 ** (0.05)
$H$ -statistic		0.13	0.10
$H=0$		5.81 *** [0.02]	772.95 *** [0.00]
$H=1$		249.27 *** [0.00]	151.31 *** [0.00]
Adj. R <sup>2</sup>		0.97	0.97
FE		0.53 ** [0.05]	13.51 ** [0.01]
Observations		205	205

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*Note:* \*, \*\*, \*\*\* indicate significance at the 10%, 5% and 1% level, respectively. FE: test for redundant fixed effects. Standard errors are reported in parenthesis and p-values are reported in brackets.

The estimated “ $H$ -statistic” to test the degree of competition in the banking sector has a value of 0.13, which reduces to 0.10 when we control for reserve requirements. The “ $H$ -statistic”, as a measure of the competitiveness, is defined as the sum of the elasticities of the reduced forms revenue with respect to input prices (unit price of funds, capital and labor). In the presence of CRR, the percentage of unremunerated reserves is an opportunity cost that commercial banks will tend to pass to their customers. Therefore, in the calculation of the  $H$ -statistic, we should also sum the CRR-elasticity. The inclusion of  $CRR$  in the model specification implied a decrease in the  $H$ -statistic, that is, a lower degree of competition. This result is in line with that obtained by the conduct parameter approach, as changes in reserves alter the competition dynamics by increasing commercial banks mark-up and reducing competitiveness.

It is important to put these results in perspective by comparing them with other empirical researches that employ a similar approach to estimate the degree of competition in the banking sector. When Belizean banking system is compared to other countries, the average  $H$ -statistic for all banks of Guyana is at 0.47 (Ganga, 2010), Dominican Republic is at 0.72 (Claessens and Laeven, 2004), Mexico is at 0.50 (Gelos and Róldos, 2004), Greece is at 0.43, Latvia is at 0.18 and Spain is at 0.43 (Delis *et al.*, 2008).

The Wald test for  $H=0$  (monopoly) and  $H=1$  (perfect competition) are rejected in both cases at traditional significance levels, suggesting that the dominant market form is that of monopolistic competition. This finding is consistent with conduct-parameter previously estimated.

## **6. The inefficiency hypothesis**

The inefficiency hypothesis of operating commercial banks in Belize has been suggested as one of the prevailing causes of high interest rates, and therefore weak access to credit. To address this issue, we apply the non-parametric Data Envelopment Analysis (DEA) method

to obtain the X-efficiency (ESX) and Scale-efficiency (ESS) proposed by Berger (1995). The ESX hypothesis implies that banks experience lower costs due to managerial efficiency or better technologies, while the ESS is a measure of scale efficiency where banks that produce at more efficient levels than others, have lower unit costs and higher profits. Low efficiency levels are expected to be associated to high interest rates.

To compute the efficiency measures (ESX and ESS), we follow the DEA methodology (Charnes *et al.*, 1978) based on mathematical linear programming which basically measures the distance between the relative efficiency of each Decision Making Unit (DMU) to the efficient frontier. We employ an input-oriented (intermediation) approach since the DMUs (commercial banks, in our case) act as financial intermediaries. We consider a variable-returns-to-scale (VRS) linear programming model which is described as follows:

$$\begin{aligned}
 & \min_{\theta, \lambda} \theta \\
 & \text{s.t.} \quad -y_i + Y\lambda \geq 0 \\
 & \quad \quad \theta x_i - X\lambda \geq 0 \\
 & \quad \quad N1\lambda = 1 \\
 & \quad \quad \lambda \geq 0
 \end{aligned}$$

where  $\theta$  is a scalar which represents the efficiency score for the  $i$ th bank ranging from 0 to 1,  $\lambda$  is a  $N \times 1$  vector of constants,  $y$  is the output vector for the  $i$ th bank,  $Y$  is the matrix of outputs of the other DMUs and the number of DMUs ranges from  $i=1, \dots, n$ ;  $x$  is a vector of inputs of the  $i$ th DMU and  $X$  is the matrix of input of the other DMUs. If  $\theta$  is equal to 1, then bank lies on the efficient frontier, that is, it is fully efficient. When the convexity constraint  $N1\lambda = 1$  is omitted, we obtain the CRS based efficiency scores. Therefore, the ESS is measured as the ratio of CRS to VRS and VRS is interpreted as the managerial efficiency score (ESX).

In this study, we consider two inputs: interest rate expenses and non-interest expenses. The output variable (total loans) captures the traditional lending activities of banks.<sup>14</sup>

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<sup>14</sup> For other applications of DEA methodology on the banking system see Chortareas *et al.* (2012), Garza-García (2011), Goldberg and Rai (1996), Berger (1995).

It is important to note that greater efficiency may increase both profits and market share, thus resulting in a spurious relationship, this fact was taken into account in Section 3.

Using the Bankscope database, we calculated the ESS and ESX scores for some Caribbean and Central American countries: Antigua and Barbuda, The Bahamas, Barbados, Costa Rica, Dominica, Dominican Republic, Grenada, Guyana, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago. This analysis will allow us to compare Belize's performance with the regional standard.

**Table 16. Efficiency scores for Caribbean and Latin American countries – 2002-2009**

Score	Country	2002	2003	2004	2005	2006	2007	2008	2009
ESS	Antigua and Barbuda	1.00	1.00	1.00	0.98	0.72	1.00	0.99	1.00
	The Bahamas	0.77	0.91	0.95	0.81	0.48	0.91	0.89	0.94
	Barbados	0.62	0.69	0.63	0.56	0.36	0.75	0.79	0.82
	Belize	0.91	0.95	0.82	0.83	0.84	0.85	0.85	0.87
	Costa Rica	0.96	0.98	1.00	0.85	0.68	0.90	0.87	0.95
	Dominica	n/a	n/a	n/a	n/a	n/a	1.00	0.99	1.00
	Dominican Republic	1.00	1.00	0.99	0.93	0.77	0.83	0.81	0.87
	Grenada	1.00	n/a	1.00	0.84	0.70	1.00	0.98	1.00
	Guyana	1.00	1.00	1.00	0.95	0.80	1.00	0.99	1.00
	Panama	0.87	0.95	0.97	0.88	0.84	0.89	0.90	0.94
	Saint Kitts and Nevis	1.00	1.00	0.80	0.81	0.70	0.99	0.99	1.00
	Saint Lucia	1.00	1.00	n/a	0.94	0.90	1.00	0.99	1.00
	Saint Vincent and the Grenadines	n/a	n/a	n/a	n/a	n/a	1.00	0.98	1.00
	Trinidad and Tobago	0.74	0.90	0.95	0.67	0.54	0.83	0.78	0.91
	<b>Average</b>	<b>0.91</b>	<b>0.94</b>	<b>0.92</b>	<b>0.84</b>	<b>0.69</b>	<b>0.93</b>	<b>0.91</b>	<b>0.95</b>
ESX	Antigua and Barbuda	0.18	0.27	0.19	0.45	0.30	0.42	0.44	0.49
	The Bahamas	0.65	0.51	0.33	0.59	0.75	0.75	0.71	0.71
	Barbados	0.66	0.69	0.66	0.84	0.76	0.64	0.68	0.70
	Belize	0.81	0.75	0.83	0.71	0.68	0.68	0.68	0.75
	Costa Rica	0.08	0.27	0.18	0.31	0.29	0.36	0.24	0.21
	Dominica	n/a	n/a	n/a	n/a	n/a	0.36	0.35	0.36
	Dominican Republic	0.09	0.05	0.03	0.23	0.24	0.37	0.35	0.31

Grenada	0.18	0.19	0.20	0.12	0.25	0.49	0.48	0.46
Guyana	0.11	0.40	0.12	0.22	0.31	0.25	0.26	0.27
Panama	0.31	0.22	0.38	0.21	0.16	0.57	0.59	0.58
Saint Kitts and Nevis	0.15	0.35	0.56	0.52	0.51	0.43	0.37	0.39
Saint Lucia	0.17	n/a	n/a	0.61	0.60	0.60	0.52	0.48
Saint Vincent and the Grenadines	n/a	n/a	n/a	n/a	n/a	0.53	0.58	0.47
Trinidad and Tobago	0.18	0.27	0.18	0.48	0.58	0.56	0.52	0.36
<b>Average</b>	<b>0.30</b>	<b>0.36</b>	<b>0.33</b>	<b>0.44</b>	<b>0.45</b>	<b>0.50</b>	<b>0.48</b>	<b>0.47</b>

*Note:* most of the available bank-level information is complete until end-2009.

Our findings indicate that, in average, Belize's commercial banks are among the most efficient ones in the region in terms of managerial efficiency, together with The Bahamas and Barbados's banks. However, when computing the scale efficiency measure, Belize is below the regional average.

Our efficiency analysis shows that there is a lot of heterogeneity across banks (see Annex 2). The lack of competition may be the reason for efficiency heterogeneity in the banking sector.

## 7. Conclusions

This study analyzes different hypothesis to explain the high interest rates of Belize. In the last years there have been several changes in regulations that removed many of the previous distortions, and these policy changes have had a positive impact, reducing interest rates and spreads.

First we find econometric evidence that non-remunerated reserves (RR) in Belize are effective in increasing lending interest rate (i.e. they are costly for credit takers as it significantly increases the spread without affecting the saving rate that has been close to the floor). The recent reduction in the reserves helped to reduced spreads, and the country has more room to reduce reserves to improve loans rate. According to Gray (2011), Belize is in the large set of countries with high RR, almost twice the level of Bahamas (70% higher according to the last survey).



Reserves are used for prudential, monetary control and liquidity management. For prudential purpose, further reductions in reserve requirements should be opposed to the increase in systemic risk, and Belize should study whether deposit insurance is not a better regulation. Regarding monetary control, RR restricts commercial bank balance sheet growth, and makes credit more costly; and this is exactly its objective. If the interest of Belize is to expand credit more, it should reduce RR more. Regarding this point, best practices in RR, see Gray (2011), states that the Central Bank should be clear about the intended goals, and which goals wants to prioritize. High RR combined with minimum saving rates is a policy to tightened monetary policy through the reduction of bank's balance sheet expansion, without attracting capital inflows from abroad (what could have been the case if regulated interest rates are increased to tighten monetary policy), and therefore without putting pressure on the exchange rate.

Related to the previous point, we find that the regulation of the minimum saving rate has been binding, what means it prevented the RR to pass through to depositors (through lower interest rates). High minimum saving rates pushed lending rates up, as expected, making credit more expensive. The recent reductions in the minimum rate were followed one by one by reductions in the market saving interest rates. Currently the saving rate is closer, although still higher, than other countries in the Caribbean, such as Barbados and the Bahamas, what again shows Belize could reduce saving rates more eliminating the minimum rate.

The reduction in the minimum saving rate, though, seems to have not been passed through to loan rates at the same speed, as the spread has increased. This low response, although, seems to be more a measurement problem than a real asymmetric effect, as the Central Bank statistics shows only weighted interest and not marginal rates, therefore the different duration between borrowing and lending is affecting the comparison. We expect the spread to be lower in the near future as more new loans are given with the new rates. A carefully study of marginal rates would help to prove this point.

The next important result of our work is that the banking system in Belize shows a very large difference between the ex-ante and ex-post spreads, and this relates to the very high percentage of nonperforming loans. The evidence shows these costs are passed through to

customer making credit more expensive. This has a mayor effect, since the ex-post spreads are half the ex-ante spread. It remains to be studied to what extent this difference reflects intrinsic risk of the country or the deficiencies of the regulatory body (for instance, the lack of a credit bureau), or they reflect inefficiencies of the banks that can be passed through to customers due to market power.

The evidence we find related to the last point is mixed. On the one hand, when we study efficiency we find the country, as a whole, has high technical efficiency (X efficiency), similar to Barbados or the Bahamas, but with a lot of heterogeneity across banks. Less efficient banks are, at the same time, the banks with higher ratios of non-performing loans. The question is, then, how so heterogeneous banks can subsist in a small market that could easily accommodate a lower number of competitors. It seems the reason these banks can survive is the competitive structure of the industry, which lacks of competition, as our market power analysis shows. We first test with bank level data whether differences in banks profits reflects differences in efficiency (more efficient banks have larger market share, as Demsetz postulated) or market power. The evidence points out to market power. Then we run two different models to test market power, finding evidence that market power is high in Belize.

Another interesting result of our study is that the good X efficiency levels are in part compensated off by low levels of scale efficiency: Belize has the lowest score in this, only Barbados has a poorer score (even smaller Caribbean countries have better scores). Barbados has five banks as Belize, and two of them operates in both countries with similar levels of efficiency.

These results suggest that more competitive pressure on the sector would improve efficiency and reduce spreads. The scale of the economy might be seen as a restriction to induce more competition, since banking industry has high economies of scale and in equilibrium the expected number of bank operating in the country is low, what might give room to market power. But smaller countries in the region are able to reach lower spreads, what shows Belize has room to reduce spreads and improve credit condition. The case of Barbados is very informative in the international benchmarking: it has 5 banks as Belize, it has similar level of bank efficiency (both X and scale efficiency), but it has a saving rate 50

basic point lower, and an average loan rate 400 basic point lower than Belize (what shows Barbados' spread is significantly lower).

The policy recommendations that emerge from this study are the following. First, the reduction in the minimum saving rate and the non-remunerated reserves implemented in the last years have had positive effects on the rates and spread, and further reductions will improve them even more. This is a rather obvious result, as the effect of both policies is precisely to increase lending rates. The country, therefore, should re-think whether really want to make credit expensive (or it could evaluate other ways to tighten monetary policy).

Second, our results suggest that the increase in competition in the 2000s helps to explain the reduction in the spread, and this is related to the fact that banks in Belize are able to influence prices. Looking at the current situation of the banking sector, many policies to reduce market power emerge. Some of them are:

(i) improve credit information sharing, as asymmetric information ties borrowers to one institution undermining competition for clients and increasing hurdles for new institutions to come into the market. An efficient credit bureau will reduce the asymmetric information problem and improve the assessment of risks.

(ii) establish a deposit insurance system, which might allow reductions in the statutory reserve requirements, which currently acts dually as a monetary policy tool and prudential reassurance to depositors. This would allow the reduction of cash and liquidity reserve requirements for commercial banks

(iii) improve check clearing process

(iv) improve interconnectivity in the ATM network

(v) establish modern consumer protection laws, or at least some regulations specific to banks to protect customers and prevent arbitrary behavior from banks. This would help to prevent hidden fees and charges that can add several percentage points to the loan interest.

These are all policies that point out to promote competition. Nevertheless, our estimations suggest that a more direct way to improve credit conditions is to eliminate the minimum saving rate (what would put pressure on lending rates) or even to reduce the reserve

requirements (which increases the interest rate spread). The monetary instruments that Belize has chosen to manage monetary expansion are costly for borrowers when credit expansion is tightened, showing a policy trade off. It is up to Belize to revise this policy. If the country wants to manage liquidity without affecting loan rates, there are other policy options it can implement.

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## Annex 1. International comparison in credit conditions

Table 17. Financial Sector. Enterprise Survey Result by firm size.

Indicator	Belize	Barbados	Bahamas, the	Guyana	Latin America & Caribbean	World
Percent of firms with a checking or savings account	100,0	97,4	97,6	100,0	92.9	87.9
Small (5-19)	100.0	96,0	95,7	100,0	91.3	85.6
Medium (20-99)	100.0	100,0	100,0	100,0	94.7	92.6
Large (100+)	100,0	100,0	100,0	100,0	96.7	95.6
Percent of firms with a bank loan/line of credit	43.9	58,2	34,2	50,5	47.6	35.6
Small (5-19)	43.7	58,1	28,4	38,9	40.4	29.3
Medium (20-99)	41.6	53,5	43,6	54,6	56.4	43.9
Large (100+)	77.3	75,6	35,0	63,9	67.5	55.1
Proportion of loans requiring collateral (%)	97.5	50,9	81,3	84,5	72.4	77.9
Small (5-19)	97.9	31,9	74,1	96,3	70.6	77.3
Medium (20-99)	96.0	92,0	85,6	79,6	74.6	81.1
Large (100+)	100.0	91,9	96,4	79,5	75.5	80.4
Value of collateral needed for a loan (% of the loan amount)	182.4	138,1	231,6	202,2	197.3	164.5
Small (5-19)	194.1	n.a.	160,0	242,6	225.6	168.4
Medium (20-99)	147.8	144,0	252,8	190,5	175.8	160.9
Large (100+)	n.a.	160,8	n.a.	168,4	166.5	148.7
Percent of firms not needing a loan	44.4	64,6	49,2	50,4	42.1	39.8
Small (5-19)	42.3	74,3	40,2	50,7	43.5	40.7
Medium (20-99)	51.1	44,4	53,6	53,7	39.5	39.1
Large (100+)	37.4	53,1	83,8	42,3	41.5	40.0
Percent of firms using banks to finance investments	36.7	45,5	14,6	34,5	33.6	26.3
Small (5-19)	33.1	55,0	15,3	30,2	29.9	22.3
Medium (20-99)	47.1	26,8	21,1	31,0	33.8	28.4
Large (100+)	n.a.	19,6	2,2	46,3	38.1	35.7
Proportion of investments financed internally (%)	76.3	72,6	83,1	55,8	63.2	68.7
Small (5-19)	77.3	75,8	86,4	50,4	64.0	70.5
Medium (20-99)	74.5	60,7	71,8	59,6	62.5	67.8
Large (100+)	n.a.	90,1	94,6	55,5	62.4	64.9
Proportion of investments financed by banks (%)	18.1	12,8	11,7	21,6	20.3	16.9
Small (5-19)	16.8	13,8	9,7	19,1	18.2	14.5
Medium (20-99)	20.5	10,9	20,2	17,6	20.4	18.2
Large (100+)	n.a.	9,2	2,2	31,9	24.0	22.2

Source: Enterprise Survey, The World Bank

**Table 18 (cont.). Financial Sector. Enterprise Survey Result by firm size.**

Indicator	Belize	Barbados	Bahamas, the	Guyana	Latin America & Caribbean	World
Proportion of investments financed by supplier credit (%)	0.5	10,1	1,5	7,1	7.5	4.5
Small (5-19)	0.1	4,3	2,5	3,2	7.0	4.2
Medium (20-99)	1.5	26,7	1,0	10,5	8.6	4.9
Large (100+)	n.a.	0,7	0,0	5,5	7.1	4.4
Proportion of investments financed by equity or stock sales (%)	5.1	0,8	2,2	7,9	4.3	4.5
Small (5-19)	5.7	0,7	1,4	15,2	5.0	4.8
Medium (20-99)	3.1	1,2	2,6	4,9	4.2	4.2
Large (100+)	n.a.	0,0	3,2	4,7	3.9	4.4
Percent of firms using banks to finance working capital	57.0	38,7	28,5	59,4	43.0	29.8
Small (5-19)	55.4	37,5	33,1	48,0	38.4	24.5
Medium (20-99)	58.9	30,7	21,5	63,2	47.3	37.3
Large (100+)	91.6	72,8	26,8	72,8	55.8	44.9
Proportion of working capital financed by banks (%)	18.3	14,8	11,2	19,6	16.0	12.2
Small (5-19)	17.7	14,4	13,4	19,8	14.2	10.1
Medium (20-99)	18.7	13,2	9,4	18,3	17.4	15.1
Large (100+)	34.9	22,6	5,3	22,0	21.4	18.4
Proportion of working capital financed by supplier credit (%)	14.8	11,6	17,6	23,7	18.1	11.7
Small (5-19)	15.2	11,0	18,5	19,3	17.5	11.0
Medium (20-99)	13.6	14,7	15,8	26,1	18.8	13.0
Large (100+)	15.7	6,6	18,4	27,0	18.5	13.3
Percent of firms identifying access to finance as a major constraint	66.8	41,1	12,9	18,3	30.8	31.7
Small (5-19)	67.5	44,8	12,0	17,2	31.8	33.4
Medium (20-99)	66.1	28,2	17,8	19,6	29.3	29.6
Large (100+)	50.1	56,1	1,9	17,1	21.4	24.4

Source: Enterprise Survey, The World Bank

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