Long-Term Finance Provision: National Development Banks VS. Commercial Banks

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1. Introduction

Long-term finance is indispensable for long-run economic growth and structural transformation (Aghion et al., 2005; Beck, 2012; Campbell, 2006; Diamond, 1991). Long-term financing has been perceived to fall far short of investment needs of developing countries, especially when it comes to infrastructure finance. To reverse the prolonged decline in the supply of long-term funding especially after the recent global financial crisis of the late 2000s, national development banks (NDBs) have been rejuvenated to fill the financing gap. For instance, Belarus established the

Development Bank of the Republic of Belarus in 2011 to support government programs related to long-term finance. The Tanzania Agricultural Development Bank Limited was created in 2012 in order to support the government's initiative on agricultural development. In 2015, the president of Ecuador announced the creation of BanEcuador B.P., a bank devoted to supporting the country's socioeconomic development.[1] In 2019, Nepal created the Nepal Infrastructure Bank Limited, a "national level infrastructure development bank" which can "act as a catalyst for building long-term and sustainable infrastructure-led economic growth in Nepal."[2] In 2019, Uzbekistan, is planning to build the Uzbekistan Development Bank.[3]

NDBs are government-supported financial institutions with an official mission of promoting public policy objectives (Xu et al., 2019). This working definition distinguish NDBs from similar institutional arrangements. First, NDBs are financial institutions which distinguish themselves from government agencies or financing vehicles without legal entities. Second, unlike profit-maximizing commercial banks, NDBs should fulfill public policy objectives. Last but not least, as financial institutions NDBs need to make profits or at least break even; by contrast, while aid agencies are development-oriented legal entities, they rely on budgetary transfer without the imperative of making profits. For the purpose of this paper, we have taken a stricter definition of NDBs by highlighting that NDBs usually issue bonds on capital markets and do not take household deposits in sharp contrast with retail deposit-taking commercial banks.

Our paper aims to empirically examine whether NDBs provide long-term loans than commercial banks and whether such a maturity-lengthening role depends on different development stages. NDBs are a relatively understudied topic. While the existing literature has argued that state-owned banks are more likely to play a countercyclical role by providing more credits in times of crises (Brei and Schclarek, 2013, 2015, 2018), few has distinguished state-owned NDBs from state-owned commercial banks, let alone examining behavioral difference, if any, in the maturity-lengthening role.

Drawing on a novel hand-collected list of NDBs, our paper merges NDBs with bank-level data at the BankFocus which enables us to empirically examine whether NDBs are able to lend longer than commercial banks and whether such a maturity-lengthening role hinges on development stages. After controlling macroeconomic and bank-level variables, our main findings are as follows: the maturity of NDB loans is longer than that of commercial bank loans and NDBs in middle-income countries are more likely to provide long-term loans that those in low-income countries or high-income countries.

The remainder of the paper proceeds as follows. Section 2 describes the data and

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[1] BanEcuador B.P web. History. [accessed April 12, 2019]. Available from https://www.banecuador.fin.ec/institucion/historia/.

[2] NIFRA web. Background. [accessed April 13, 2019]. Available from http://www.nifrabank.com/pages/background.

[3] Gazeta news web. Central Bank of Uzbekistan. [accessed April 23, 2019]. Available from https://www.gazeta.uz/ru/2019/02/08/development-bank/.

the construction of the bank type variable. Section 3 proposes the econometric model and hypotheses. Section 4 presents the empirical results. Section 4 concludes and proposes the future directions of research.

2.   Data and variables

2.1. Sample construction

We begin our sample construction process with the identification of NDBs worldwide. As NDBs are one category of development finance institutions (DFIs), we build on the database on development finance institutions (DFIs) worldwide constructed by the Institute of New Structural Economics (INSE) at Peking University. For the first time, the INSE team provides a rigorous working definition of DFIs and systematically identifies more than 530 DFIs worldwide (Xu, Ren, and Wu, 2019). DFIs are conceptually defined as government supported financial institutions with an official mission to achieve public policy objectives. To operationalize this definition to identify DFIs worldwide, Xu, Ren and Wu (2019) use two operational criteria: one is to examine whether the official mandate stated in the Articles of Agreement or official websites is development-oriented or not; the other is to investigate whether the financial institution is an legal entity to distinguish DFIs from government agencies or funds in pursuit of development objectives. To narrow down our focus, we first select DFIs at the national level, deleting multilateral and subnational ones. Furthermore, we select national development banks out of national DFIs by deleting non-bank financial institutions such as equity investment vehicles, insurance and guarantee-providing financial institutions.

To make a clear distinction between NDBs and commercial banks, we take a further step to collect data on funding sources. Recently, some NDBs have undertaken commercial banking business. On the liability side, NDBs may take deposits from households, just as commercial banks do; thus, NDBs can get involved in national payment systems. On the asset side, NDBs may provide short-term working capital and even venture into commercial and investment banking. Lumping this group of NDBs with the conventional type of NDBs, which do not take household deposits and provide long-term finance, will bias our results. As household deposits are often short-term, banks are less able to provide long-term finance. For this reason, we decide to focus primarily on non-retail-deposit-taking NDBs. In terms of being retail deposit taking, this implies that the bank is offering bank accounts (current accounts, savings accounts, etc.) to individuals, with several bank branches and ATMs, offering credit cards, and giving consumer loans. To identify whether an NDB takes household deposits or not, we examine official websites of all NDBs one by one to see whether banks provide personal banking business.

Our next step is to construct our sampling frame of commercial banks. We

primarily use the dataset on foreign ownership of banks constructed by Claessens and van Horen (2013).[4] The virtue of this dataset is that the authors manually collect the data to solve the problem of double counting, i.e., the parent bank and subsidiary bank are counted at the same time.

We match NDBs and commercial banks with BankFocus to enable us to use the balance sheet information of banks. When matching, we use consolidated financial statements if available; otherwise, we use unconsolidated financial statements instead.[5]

2.2. Bank types

To study the loan maturity of NDBs and commercial banks, we further categorize banks by ownership types.

We start by categorizing the banks as "Foreign" or "Domestic", comparing for each bank the Bankfocus variable "Country ISO code" with the Bankfocus variable "GUO – Country ISO code" from "Ownership data/Shareholders/Global Ultimate Owner information". If both codes are the same, then the bank is "Domestic"; if not, the bank is "Foreign". For those cases where there is no value for the "GUO – Country ISO code" or the value is "n.a." (not available), we use the classification of the Bank Ownership Database by Claessens and Van Horen. In their Excel spreadsheet, for each bank we look at their column "BG". If the value is "DOM", then the bank is "Domestic"; if not, the bank is "Foreign".[6] If the bank has no "GUO – Country ISO code" and is not classified in the Bank Ownership Database, we manually categorize banks using available information from, for example, the banks´ webpages. If we still cannot determine if it is "Domestic" or "Foreign", we assume it is "Domestic".

Next we categorize the banks as "State-owned" or "Private-owned". Firstly, for each bank, we analyze the Bankfocus variable "GUO - Type" from "Ownership data/Shareholders/Global Ultimate Owner information". If the value is "Public authority, state, government", then it is "state-owned". Secondly, for those banks for which the Bankfocus variable "Specialization" in "Industry & activities/Industry classification" is "Specialized Governmental Credit Institution", we categorize as

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[4] Their dataset contains full ownership data for the period 1995-2009 of all commercial banks, saving banks, bank holding companies and cooperative banks (as identified in Bankscope) that are currently or have been active in 137 countries.

[5] The same BVD ID number corresponds to multiple consolidation codes as the same organization has multiple data due to different accounting standards. Each data corresponds to different BVD bank index number. Following the existing literature (Brei and Schclarek, 2013, 2018; Birchwood, Brei and Noel, 2017), we use the financial standards of C1, C2 and U1 to get the index number of each matched bank. The Bankfocus classification regarding consolidated statements is as follows. For any bank, if there is both consolidated and unconsolidated statements data, the consolidated statements data has the "Consolidation code" C2 and the unconsolidated statements data has the "Consolidation code" U2. If the bank only has consolidated data, the "Consolidation code" is C1. If the bank only have unconsolidated data, the "Consolidation code" is U1. Then, because we always prefer working with consolidated data, we will use data with "Consolidation code": C2, C1 and U1. In other words, we do not use data with "Consolidation code" U2 because that means that there is C2 data available, that we prefer. We do not want to use data with "Consolidation code" C* and U* because that is special data that has been, for example, adjusted by inflation.

[6] In their spreadsheet, you get the specific name of the foreign country of ownership, but we are only interested in classifying by "Domestic" or "Foreign".

"State-owned", independently on what the value of the Bankfocus variable "GUO - Type" is. Thirdly, if the above two methods cannot enable us to identify ownership, we manually categorize banks as "State-owned" using available information from the banks´ webpages or other reliable sources. We require that the total state or government ownership must exceed 50% of the bank shares and may be owned by different state or government entities. However, we do not count "foreign" state or government entities. If the total state or government ownership is less than 50%, we treat it as "privately-owned". Fourthly, for those banks that are "State-owned", but "Foreign", we categorize them as "privately-owned". These banks are owned by foreign states or governments, and, thus, we treat them as "privately-owned" because we assume that foreign states or governments are not interested in maximizing the welfare of the host country, but of maximizing the welfare of their home countries, which imply that when abroad they are maximizing profit and acting as private-owned banks. [7] For the rest of the banks, we assume they are "Private-owned".

The reason why we do not collect the data on the ownership chain as the existing literature (Caprio, Laeven, and Levine, 2007; Garcia-Kuhnert, Marchica, and Mura, 2015) does is that the size of our sample is 1253, which is too large to make the detailed examination of the ownership pyramid feasible.

2.3. Maturity of loans

Our measure for loan maturity is from BankFocus, which allows us to identify bank-level data in each year. On the asset-side of balance sheets, three variables, i.e., loans to customers, loans to banks, and debt securities, are relevant to the measurement of our dependent variable. All of the three variables are reported by the following terms: less than 3 months, 3-12 months, 1-5 years, and more than 5 years. Based on the raw data, we further construct a new term, i.e., less than 1 year, which is conventionally regarded as short-term loans or assets. One caveat is that the maturity here refers to terms of loans maturing within certain periods. For instance, a bank may grant a loan with a maturity of 10 years; if the loan will mature in one month, it will be recorded in loans to customers less than 3 months. Building on the raw data, we construct loan ratios by term such as loans to customers less than 1 year as a percentage of total loans to customers. We further construct the ratios of loans to banks by term to total loans to banks as well as the ratios of debt securities by maturity to total debt securities. In our regression analysis, we first deploy ratios of loans to customers as the dependent variable and then use ratios of loans to banks in the robustness checks.[8] In addition, we also analyze the maturity of debt securities to

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[7] It is different when they act domestically; there, the state or government cares about the economy as a whole, and not only about profit maximization. Examples are ICBC in China with "BvD bank index number": 50040 (www.icbc.com.cn), which is a domestic State-Owned Purely CB (SPCB), or ICBC in Argentina with "BvD bank index number": 37933 (www.icbc.com.ar), which is a foreign state-owned CB, and, thus, classified as "Foreign" and "Private-owned".

[8] While loans to bank may include short-term interbank loans for solving the liquidity problems apart from

see whether NDBs and commercial banks behave similarly in capital market operation.

To ensure the quality of data, we have taken three steps to clean our dataset. First, we identify all negative loan ratios and turn them into missing values. There are 10 negative loans detected; so the analysis would not use that bank in that year. Second, banks without any loans that fall into the category of less than 3m or 3-12m, and turn that bank in that year as missing values. The rationale is that it is very unlikely if a bank has no loan maturing within one year.[9] There are altogether 5 cases (observations defined by bank-year pair) with 0 loan less than 3m or 3-12 m. Third, we generate an inconsistency indicator about cross-year loan structure differences. It is unlikely that a bank primarily offers short-term loans in one year and then shift to long-term loans next year. We consider 4 kinds (maturity) of loan ratios for each bank in each year (each observation), so these 4 figures can be regarded as a point with 4 coordinates in a dimension-4 simplex (the 4 ratios sum to 1 and are nonnegative). For each bank, there are 8 years; so the Euclidean difference between two points in any two years is calculated: the theoretical range for this two-year difference is from 0 to $2^{0.5}$. Thus we get $C^2_8=28$ differences for each bank. Then we average the 28 differences for each bank and this is defined as "cross-year loan-structure inconsistency" indicator; the larger this indicator, the more inconsistent the loan structure of this bank across years. For all the analysis, we take them to the full sample as well as a sub-sample excluding the largest 5 percentile of this indicator for robustness; all the qualitative results are the same between the two so we omit the results from the subsample excluding the largest 5 percentile in inconsistency indicator.

2.4. Control variables

To assess the impact of bank types on loan maturity, we control for other factors that might affect the maturity of bank loans. These factors include bank-specific characteristics as well as macroeconomic factors. In terms of the bank-specific characteristics, these variables, notably bank size, liquid assets, capitalization, profitability, and funding structure, have been used previously in the bank lending channel literature (Brei and Schclarek, 2013, 2018; Brei et al., 2013; Ehrmann and Worms, 2004; Gambacorta, 2005; Kashyap and Stein, 1995; and, Kishan and Opiela, 2000). Note that although our paper is the only one, to the best of our knowledge, that study the maturity of the loans, in contrast to the growth rate of lending, as in the bank lending channel literature, it is expected that both dependent variables are affected by similar bank specific characteristics. In terms of the country-specific macroeconomic variables, these have also been used by the above-mentioned bank lending channel

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on-lending via financial intermediaries to end customers, this may underestimate the maturity-lengthening role of NDBs. If the data could exclude short-term interbank loans, it would have strengthened our result.

[9] Note that "no loan" means 0 instead of "missing".

literature. Detailed definitions for all the variables used in the paper are provided in Table 1.

Table 1 Definition of variables

Variable names	Variable definitions	Data Source
Dependent variables		
Loans to customers < 3 months or on demand	Loans and advances to customers on demand or with maturities less than 3 months [80640]	BankFocus
Loans to customers 3-12 months (or < 12 months if not specified)	Loans and advances to customers with maturities greater than 3 months but less than 1 year [80650]	BankFocus
Loans to customers < 1 year	Loans and advances to customers with maturities greater than 1 year but less than 5 years [sum of 80640 and 80650]	BankFocus
Loans to customers 1-5 years	Loans and advances to customers with maturities greater than 1 year but less than 5 years [80660]	BankFocus
Loans to customers > 5 years (or not specified)	Loans and advances to customers with maturities greater than 5 years or maturity unspecified [80670]	BankFocus
Loans to banks < 3 months or on demand	Inter-bank loans and advances at on demand or with maturities less than 3 months [80740]	BankFocus
Loans to banks 3 – 12 months (or < 12 months if not specified)	Inter-bank loans and advances with maturities greater than 3 months but less than 1 year [80750]	BankFocus
Loans to banks < 1 year	Inter-bank loans and advances with maturities less than 1 year	BankFocus
Loans to banks 1 – 5 years	Inter-bank loans and advances with maturities greater than 1 year but less than 5 years [80760]	BankFocus
Loans to banks > 5 years (or not specified)	Inter-bank loans and advances with maturities greater than 5 years or maturity unspecified [80770]	BankFocus
Others		
Debt securities < 3 months	Amount of debt securities with maturities less than 3 months [80690]	BankFocus
Debt securities 3-12 months (or < 12 months if not specified)	Amount of debt securities with maturities greater than 3 months but less than 1 year [80700]	BankFocus
Debt securities < 1 year	Amount of debt securities with maturities less than 1 year	BankFocus
Debt securities 1-5 years	Amount of debt securities with maturities greater than 1 year but less than 5 years [80710]	BankFocus
Debt securities > 5 years (or not specified)	Amount of debt securities with maturities greater than 5 years or maturity unspecified [80720]	BankFocus

Independent variables		
NDB dummy	A dummy variable that equals one if the bank is a NDB and zero otherwise.	
Bank type	1 for NDBs, 2 for state-owned commercial banks (SCBs), 3 for domestic privately-owned commercial banks (PCBs), and 4 for foreign privately-owned commercial banks (FCBs)	
Macroeconomic factors		
The annual real GDP growth rate		WDI
The real interest rate		WDI
Inflation		WDI
The lagged exchange rate depreciation		WDI
GDP per capita	In thousand USD	WDI
Bank characteristics		
bank size: logarithm of total assets	logarithm of total assets to measure bank size [52600]	BankFocus
return on equity (ROE)	Net income as a percent of average total equity. Average total equity excludes Hybrid capital. Interims are annualized. [99480]	BankFocus
Capitalization: total equity as a percentage of total assets	Total Equity as a percent of total assets. Total equity excludes Hybrid capital [99060]	BankFocus
NPL ratio (as reported)	The sum of impaired, restructured loans and past due but not impaired loans as a percent of gross customer loans & advances. [99300]	BankFocus
liquid assets as a percentage of total assets	Liquid assets including available for sale, held to maturity and other securities as a percent of total assets.	BankFocus
funding structure	customer deposits as a percentage of total funding excluding derivatives [99690]	BankFocus
mortgage lending to total gross lending	Mortgage lending refers to total mortgage loans and receivables outstanding book value on amortized basis	BankFocus
long-term funding plus equity to total assets		BankFoucs; calculated by authors

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Table 2 Summary statistics

This table presents the mean, standard deviation (STD), and number of observations (*N*) for all the variables used in the paper. The sample consists of 1253banks in 106 countries during the period from 2011 to 2018.

Variable	Obs	Mean	Std.Dev.	Min	Max
Loans to customers < 3 months or on demand as a percentage of total loans to customers	7273	.203	.174	0	.997
Loans to customers 3-12 months (or < 12 months if not specified) as a percentage of total loans to customers	7273	.18	.132	0	.914
Loans to customers < 1 year as a percentage of total loans to customers	7273	.383	.228	0	1
Loans to customers 1-5 years as a percentage of total loans to customers	7273	.308	.144	0	.918
Loans to customers > 5 years (or not specified) as a percentage of total loans to customers	7273	.309	.23	0	.992
The annual real GDP growth rate	9992	3.286	2.689	-9.773	25.163
Inflation	9796	3.384	5.095	-3.749	254.949
The real interest rate	5946	5.791	8.624	-31.923	51.285
The lagged exchange rate depreciation	8060	.459	37.694	-.148	3384.061
bank size:	8375	15.225	2.189	8.25	21.946

logarithm of total assets					
return on equity (ROE)	8371	6.418	184.818	-13200	6231.61
Capitalization: total equity as a percentage of total assets [10]	8372	12.044	9.284	-27.18	98.11
NPL ratio (as reported)	7632	10.914	16.913	0	147.23
liquid assets as a percentage of total assets[11]	8367	35.127	17.15	.28	100
Mortgage lending to total gross lending	4242	.288	.288	0	1
Long-term funding plus equity to total assets [12]	6669	19.914	14.969	-15.566	98.81
funding structure	8110	65.534	31.873	0	100.01
GDP per capita(In thousand USD)	9984	28.332	27.858	.406	107.48
Loans to banks < 3 months or on demand as a percentage of total loans to banks	1436	.578	.3	0	1
Loans to banks 3 – 12 months (or < 12 months if not specified) as a percentage of total loans to banks	1436	.149	.159	0	.923
Loans to banks < 1 year as a percentage of total	1436	.727	.266	.021	1

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[10] We have 35 (0.418%=35/8372) samples with negative percentages of "equity-to-total-assets ratio". When liabilities are greater than assets (equity is negative), banks do not necessarily go bankrupt according to bankruptcy law. So in practice it is possible to have negative values of equity, and further, the ratio of "negative values of equity" in the sample is very small.

[11] Originally there were 3 (0.036%=3/8367) samples with "liquid assets as a percentage of total assets">100: 100.69, 105.66, 106.77, respectively; for whatever sake of reasonable consideration, we censor the values of these 3 samples to 100.

[12] We have 15 (0.225%=15/6669) samples with negative percentages of (long-term fund + equity) over total assets.

loans to banks					
Loans to banks 1 – 5 years as a percentage of total loans to banks	1436	.16	.171	0	.957
Loans to banks > 5 years (or not specified) as a percentage of total loans to banks	1436	.113	.166	0	.979
debt securities ratio <3m	2794	.188	.21	0	1
debt securities ratio 3-12m	2794	.17	.152	0	.917
debt securities ratio<1y	2794	.357	.252	0	1
debt securities ratio 1-5y	2794	.415	.221	0	.986
debt securities ratio >5y	2794	.227	.206	0	1

3.   Econometric models and hypotheses

We first use the panel analysis to examine the relationship between bank type and loan maturity. We adopt the following standard panel regression framework:

$$Loan\ with\ term\ j\ /total\ loan_{it} = \gamma_j \cdot bank\ type_{it} + \alpha \cdot controls_{it} + \varepsilon_{ijt}$$
(1)

In Eq. (1), i, j and t are subscripts for bank, loan term and year respectively. The dependent variable $Loan\ with\ term\ j\ /total\ loan_{it}$ is equal to the amount of loans to customers with a certain term (such as less than 1 year, 1-5 years and more than 5 years) as a percentage of total loans to customers. It is a ratio ranging from 0 to 1. $bank\ type_{it}$ is a dummy variable equal to one if bank i is a NDB. $controls_{it}$ is a vector of control variables, including macroeconomic factors and bank characteristics. The coefficient of key interest is thus γ_j, which indicates the differential change in the loan maturity due to different bank types.

Hypothesis 1: NDBs lend longer than commercial banks.

Without any controls, we can expect $\gamma_j < \gamma_{j'}$, if $j < j'$. It is also interesting and necessary to find that γ_j turn negative into positive if the loan term is greater than 1 year.

We further compare different subtypes of commercial banks, i.e., state-owned commercial banks (SCBs), domestic privately owned commercial banks (PCBs), and foreign privately owned commercial banks (FCBs), NDBs as far as loan term is concerned. We derive the following hypothesis:

Hypothesis 2: NDBs lend slightly longer than SCBs, and significantly longer than PCBs and FCBs.

Then we examine whether the effect of bank type on loan maturity depends on development stages. The main econometric model is as follows:

$$\text{Loan term ratio}_{it} = \beta * NDB * (a * GDP\ per\ capita + b * GDP\ per\ capita^2) + \gamma * GDP\ per\ capita + controls_{it} + \varepsilon_{ijt}$$

$$(2)$$

In Eq. (2), the dependent variable is loan ratio by maturity as in the previous baseline econometric model. The variable of key interest is the interaction term, i.e., $NDB * GDP\ per\ capita^2$. If its coefficient is statistically significant, it indicates that the effect of NDBs upon loan maturity is strongest or weakest in middle-income countries (MICs). We expect that NDBs from MICs may lend longer than those from high-income countries (HICs) and low-income countries (LICs). The rationale is as follows: governments from LICs are unable to establish well-governed NDBs due to poor governance, and sovereign creditworthiness of LICs is too low for NDBs to issue long-term bonds; commercial banks in HICs have long-term savings which can better solve the problem of maturity mismatch.

Hypothesis 3: MICs lend longer than those from HICs and LICs.

4. Results

The effect of bank types on loan maturity

Our empirical analysis begins with an examination of the relationship between bank type and loan maturity. Table 3 reports the regression results without any control variables. The sample consists of bank-year level observations from 2011 to 2018. The coefficients associated with bank type turn from negative when loans are less than 1 year to positive when loans are more than 1 year. Moreover, the coefficient is increasing as the loan term is longer.

Table 3 Bank Type and Loan Maturity without Control Variables

	(1) loan_ratio_ less3m	(2) loan_ratio_ 3-12m	(3) loan_ratio_ less1y	(4) loan_ratio_ 1-5y	(5) loan_ratio_ more5y
NDB	-0.0976***	-0.0375**	-0.135***	0.0602***	0.0740**
	(-4.69)	(-2.21)	(-4.69)	(3.42)	(2.51)

cons	0.208***	0.187***	0.396***	0.306***	0.298***
	(46.52)	(51.37)	(64.05)	(81.00)	(46.94)
N	7273	7273	7273	7273	7273
N of banks	1251	1251	1251	1251	1251
Overall R-squared	0.015	0.004	0.017	0.006	0.006

Note: t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4 controls for macroeconomic factors and bank characteristics. The coefficients of bank type remain statistically significant and turn from negative to positive as the loan term changes from short-term to long-term. It indicates that NDBs are more likely to provide longer-term loans than commercial banks.

Table 4 Bank Type and Loan Maturity with Control Variables

	(1) loan_ratio_less 3_	(2) loan_ratio_3_1 2_	(3) loan_ratio_less 1_	(4) loan_ratio_1_5 _	(5) loan_ratio_mor e5_
NDB	-0.123***	-0.0390	-0.163***	0.0624**	0.0994***
	(-3.71)	(-1.45)	(-3.98)	(2.16)	(2.98)
Log of total assets	0.00172	0.000219	0.000598	-0.00828***	0.00740***
	(0.64)	(0.10)	(0.18)	(-3.56)	(2.89)
Return on average equity (ROAE)	0.00000160	-0.00000622	-0.00000445	-0.00000316	0.00000813*
	(0.24)	(-1.31)	(-0.64)	(-0.58)	(1.69)
Equity as a % of total assets	0.000884*	0.000198	0.00108*	-0.0000493	-0.00103**
	(1.80)	(0.53)	(1.95)	(-0.12)	(-2.52)
non-performing loans ratio	-0.0000870	-0.000332***	-0.000390**	-0.0000575	0.000432***
	(-0.55)	(-2.92)	(-2.33)	(-0.44)	(3.64)
Liquid assets as a % of total assets	0.00179***	-0.0000103	0.00158***	-0.000503***	-0.00106***
	(7.89)	(-0.06)	(6.28)	(-2.65)	(-5.81)
Customer deposit as a % of total funding excluding derivatives	-0.000155**	0.0000756	-0.0000855	0.0000732	0.00000268

	(-2.07)	(1.41)	(-1.09)	(1.19)	(0.05)
GDP growth	0.000504	0.00257***	0.00275**	-0.00211**	-0.000955
	(0.43)	(3.04)	(2.20)	(-2.20)	(-1.08)
Inflation	0.00140**	0.00160***	0.00284***	-0.00181***	-0.000879*
	(2.00)	(3.18)	(3.84)	(-3.15)	(-1.69)
Real interest rate	0.000621	0.000745**	0.00137***	-0.0000962	-0.00117***
	(1.49)	(2.43)	(3.02)	(-0.28)	(-3.58)
Exchange rate depreciation	0.00593	-0.0314*	-0.0253	-0.00673	0.0310
	(0.23)	(-1.70)	(-0.93)	(-0.32)	(1.64)
year dummies controlled	.	.	.	.	.
	.	.	.	.	.
_cons	0.150***	0.222***	0.402***	0.472***	0.130***
	(3.27)	(6.17)	(7.39)	(12.00)	(3.08)
N	3620	3620	3620	3620	3620
N of banks	698	698	698	698	698
Overall R-squared	0.094	0.025	0.114	0.078	0.078

To further examine the difference in loan maturity between NDBs and different types of commercial banks, we further classify bank type into four types: 1 for NDBs, 2 for state-owned commercial banks (SCBs), 3 for domestic privately-owned commercial banks (PCBs), and 4 for foreign private commercial banks (FCBs).

Table 5 reports the result without any control variables. Compared with NDBs, coefficients of commercial banks are decreasing as the loan term becomes larger. For loans from 1 to 5 years, the coefficients of PCBs and FCBs are statistically significant and negative. In other words, NDBs provide more loans with the maturity of 1-5 years than PCBs and FCBs. But the difference is not significant as it comes to SCBs. For loans more than 5 years, the coefficients of SCBs and FCBs are statistically significant and negative. In other words, NDBs provide more loans with the maturity of more than 5 years. Yet as far as loans more than 5 years are concerned, the difference between NDBs and PCBs are not statistically significant.

Table 5 Bank type by ownership and loan maturity without control variables

	(1) loan_ratio _less3m	(2) loan_ratio _3-12m	(3) loan_ratio _less1y	(4) loan_ratio_ 1-5y	(5) loan_ratio_more 5y
1 NDB	.	.	.	.	.
	.	.	.	.	.
2 SCB	0.0725***	0.0284	0.100***	-0.0131	-0.0866**
	(2.93)	(1.40)	(2.94)	(-0.63)	(-2.51)
3 PCB	0.0827***	0.0295*	0.112***	-0.0805***	-0.0310
	(3.96)	(1.72)	(3.88)	(-4.58)	(-1.06)
4 FCB	0.132***	0.0545***	0.186***	-0.0373**	-0.148***
	(6.11)	(3.08)	(6.27)	(-2.06)	(-4.93)
_cons	0.110***	0.150***	0.261***	0.367***	0.372***
	(5.50)	(9.08)	(9.42)	(21.68)	(13.29)

	7273	7273	7273	7273	7273
N					
N of banks	1251	1251	1251	1251	1251
Overall R-squared	0.028	0.011	0.035	0.040	0.059

Note: *t* statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6 presents the results with control variables. For loans 1-5 years, while NDBs lend as many loans as SCBs, PCBs and FCBs are less likely to provide the long-term loans than NDBs. For loans more than 5 years, NDBs are more likely to provide more long-term loans than commercial banks especially PCBs. Table 6 Bank type by ownership and loan maturity with control variables

	(1) loan_ratio_1ess3_	(2) loan_ratio_3_1 2_	(3) loan_ratio_less 1_	(4) loan_ratio_1_5 _	(5) loan_ratio_mor e5_
1 NDB	.	.	.	.	.
	.	.	.	.	.
2 SCB	0.0905**	-0.000709	0.0907**	-0.0174	-0.0707*
	(2.48)	(-0.02)	(2.04)	(-0.55)	(-1.93)
3 PCB	0.134***	0.0625**	0.197***	-0.0822***	-0.113***
	(3.96)	(2.31)	(4.80)	(-2.82)	(-3.36)
4 FCB	0.120***	0.0240	0.145***	-0.0521*	-0.0914***
	(3.55)	(0.88)	(3.50)	(-1.78)	(-2.69)

Log of total assets	0.00204	-0.0000773	0.000670	-0.00840***	0.00746***
	(0.74)	(-0.04)	(0.21)	(-3.58)	(2.87)
Return on average equity (ROAE)	0.00000158	-0.00000619	-0.00000444	-0.00000313	0.00000812*
	(0.24)	(-1.31)	(-0.64)	(-0.58)	(1.69)
Equity as a % of total assets	0.000871*	0.000206	0.00107*	-0.0000444	-0.00102**
	(1.78)	(0.56)	(1.95)	(-0.11)	(-2.52)
non-performing loans ratio	-0.0000730	-0.000312***	-0.000362**	-0.0000788	0.000423***
	(-0.47)	(-2.75)	(-2.16)	(-0.61)	(3.56)
Liquid assets as a % of total assets	0.00177***	-0.0000221	0.00156***	-0.000482**	-0.00105***
	(7.77)	(-0.13)	(6.24)	(-2.54)	(-5.74)
Customer deposit as a % of total funding excluding derivatives	-0.000154**	0.0000746	-0.0000855	0.0000726	0.00000275
	(-2.06)	(1.40)	(-1.09)	(1.19)	(0.05)
GDP growth	0.000370	0.00241***	0.00252**	-0.00195**	-0.000866
	(0.32)	(2.86)	(2.02)	(-2.03)	(-0.98)
Inflation	0.00138**	0.00159***	0.00282***	-0.00178***	-0.000866*
	(1.97)	(3.16)	(3.82)	(-3.11)	(-1.67)

Real interest rate	0.000611	0.000767**	0.00139***	-0.0000958	-0.00117***
	(1.47)	(2.51)	(3.06)	(-0.28)	(-3.59)
Exchange rate depreciation	0.00505	-0.0322*	-0.0267	-0.00567	0.0315*
	(0.19)	(-1.74)	(-0.98)	(-0.27)	(1.67)
year dummies controlled	.	.	.	.	.
	.	.	.	.	.
_cons	0.0243	0.188***	0.239***	0.534***	0.228***
	(0.41)	(4.10)	(3.46)	(10.70)	(4.16)
N	3620	3620	3620	3620	3620
N of banks	698	698	698	698	698
Overall r-squared	0.101	0.052	0.143	0.097	0.086

Note: t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The effect of bank type on loan maturity at different development stages

In this part, we examine whether the maturity lengthening role of NDBs hinges on development stages. As shown in Table 7, the coefficient of this interaction term is statistically significant when loans are less than 1 year or 1-5 years. Moreover, the coefficient is positive when loans are less than 1 year and negative when loans are 1-5 years. In other words, NDBs in MICs are more likely to provide the long-term loans than those in high-income countries (HICs) or low-income countries (LICs); NDBs are less likely to provide short-term loans in MICs than those in HICs or LICs.

Table 7 The effect of bank type on loan maturity at different development stages

	(1) loan_ratio_less_1_	(2) loan_ratio_1_5_
GDP per capita	-0.00192***	0.00153***
	(-5.57)	(6.31)
NDB*GDP per capita	-0.0165***	0.00695*
	(-3.13)	(1.89)
NDB*GDP per capita^2	0.000231**	-0.000115*
	(2.41)	(-1.71)
Log of total assets	0.00338	-0.0106***
	(1.02)	(-4.52)
Return on average equity (ROAE)	-0.00000489	-0.00000276
	(-0.71)	(-0.51)
Equity as a % of total assets	0.000918*	0.0000629
	(1.66)	(0.15)
non-performing loans ratio	-0.000480***	0.0000298
	(-2.85)	(0.23)
Liquid assets as a % of total assets	0.00143***	-0.000368*
	(5.63)	(-1.92)
Customer deposit as a % of total funding excluding derivatives	-0.0000873	0.0000756

	(-1.11)	(1.24)
GDP growth	0.00104	-0.000545
	(0.81)	(-0.55)
Inflation	0.00213***	-0.00116**
	(2.84)	(-1.98)
Real interest rate	0.000990**	0.000235
	(2.16)	(0.67)
Exchange rate depreciation	-0.0333	0.000269
	(-1.23)	(0.01)
year dummies controlled	.	.
	.	.
_cons	0.410***	0.464***
	(7.50)	(11.80)
N	3602	3602
N of banks	695	695
Overall r-squared	0.131	0.102

Note: t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Robustness check

To conduct the robustness check, we use loans to banks as an alternative dependent variable to see whether the pattern holds.

Table 8 and Table 9 report the regression results without any control variables, in which Table 8 reports the result where the only independent variable is the "NDB" dummy, and in Table 9 the group of dummies of bank type by detailed ownership is introduced instead of a single variable "NDB". In Table 8, the coefficients associated with bank type turn from negative when loans are less than 1 year to positive when loans are more than 1 year. This result is in line with the prediction of Hypothesis 1. Table 9 also shows that NDBs are more likely to provide long-term loans than other types of commercial banks. Yet when we distinguish banks by the 4 types of ownership, γ_j is not a unique scalar parameter in each regression, so it's hard to detect the decreasing trend of key parameters (γ_j) along the 5 regressions if moving from the shortest term (less than 3 months) to the longest term (longer than 5 years).

Table 10 controls for macroeconomic factors and bank characteristics. The coefficients of bank type remain statistically significant and turn from negative to positive as the loan term changes from short-term to long-term. It indicates that NDBs may be more likely to provide longer-term loans than commercial banks. But

the result is not statistically significant when the maturity is over 5 years. Two possible potential reasons: one might be that loans with the maturity of more than 5 years include loans whose maturity is not specified; the other one might be that the available observations are too less in this regression.

Table 8 Bank Type and Loan Maturity without Control Variables

	(1) Loan to banks 3m_ratio	(2) Loan to banks 3-12m_ratio	(3) Loan to banks 1y_ratio	(4) Loan to banks 1-5y_ratio	(5) Loan to banks 5y_ratio
NDB	-0.289***	0.00214	-0.287***	0.152***	0.137***
	(-5.60)	(0.08)	(-6.71)	(5.67)	(5.04)
_cons	0.630***	0.150***	0.780***	0.131***	0.0897***
	(43.66)	(19.18)	(65.25)	(17.27)	(11.72)
N	1436	1436	1436	1436	1436
N of banks	361	361	361	361	361
Overall R-squared	0.105	0.000	0.141	0.073	0.105

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9 Bank type by ownership and loan maturity without control variables

	(1) Loantobank3m _ratio	(2) Loantobank3-1 2m_ratio	(3) Loantobank1y_ ratio	(4) Loantobank1-5 y_ratio	(5) Loantobank5y_ ratio
SCB	0.296***	0.0107	0.306***	-0.154***	-0.155***
	(4.50)	(0.30)	(5.62)	(-4.48)	(-4.47)
PCB	0.278***	-0.0000145	0.278***	-0.150***	-0.129***
	(5.24)	(-0.00)	(6.34)	(-5.47)	(-4.63)

FCB	0.314***	-0.0129	0.300***	-0.154***	-0.148***
	(5.50)	(-0.42)	(6.36)	(-5.18)	(-4.93)
_cons	0.341***	0.152***	0.494***	0.283***	0.227***
	(6.85)	(5.74)	(12.01)	(10.98)	(8.68)
N	1436	1436	1436	1436	1436
N of banks	361	361	361	361	361
Overall R-squared	0.108	0.002	0.143	0.073	0.108

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10 Bank Type and Loan Maturity with Control Variables

	(1) Loan to banks 3m_ratio	(2) Loan to banks 3_12_ratio	(3) Loan to banks 1y_ratio	(4) Loan to banks 1-5y_ratio	(5) Loan to banks 5y_ratio
NDB	-0.0710	-0.0413	-0.112*	0.131***	-0.0199
	(-0.79)	(-0.67)	(-1.66)	(2.70)	(-0.47)
Log of total assets	0.0175*	0.00963	0.0282***	-0.0155***	-0.0128***
	(1.75)	(1.41)	(3.72)	(-2.83)	(-2.66)
Return on average equity (ROAE)	0.000475	0.000115	0.000579**	-0.000716***	0.000134
	(1.58)	(0.60)	(2.39)	(-4.03)	(0.87)

Equity as a % of total assets	-0.00258	0.00457***	0.00212	-0.00196	-0.000163
	(-1.04)	(2.76)	(1.10)	(-1.40)	(-0.13)
non-performing loans ratio	-0.000739	-0.000793	-0.00154	-0.0000513	0.00159***
	(-0.60)	(-0.97)	(-1.61)	(-0.07)	(2.63)
Liquid assets as a % of total assets	-0.000494	0.00104	0.000438	0.00102	-0.00144***
	(-0.44)	(1.37)	(0.50)	(1.59)	(-2.58)
Customer deposit as a % of total funding excluding derivatives	0.000802	-0.000501	0.000396	0.000104	-0.000516*
	(1.53)	(-1.47)	(0.94)	(0.34)	(-1.93)
GDP growth	-0.00457	-0.00104	-0.00538	0.000560	0.00490
	(-0.77)	(-0.27)	(-1.13)	(0.16)	(1.61)
Inflation	-0.00271	0.00380	0.00120	-0.00299	0.00179
	(-0.67)	(1.46)	(0.37)	(-1.26)	(0.87)
Real interest rate	-0.00233	0.0000655	-0.00221	0.00213	0.0000894
	(-1.04)	(0.04)	(-1.24)	(1.64)	(0.08)
Exchange rate depreciation	0.228	-0.306***	-0.0675	0.132	-0.0636
	(1.42)	(-3.00)	(-0.51)	(1.36)	(-0.76)

year dummies controlled	.	.	.	.	.
	.	.	.	.	.
_cons	0.423**	-0.0666	0.333**	0.359***	0.309***
	(2.25)	(-0.52)	(2.32)	(3.45)	(3.40)
N	379	379	379	379	379
N of banks	134	134	134	134	134
Overall R-squared	0.139	0.062	0.226	0.216	0.157

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Auxiliary Results

In this part, we conduct auxiliary analysis to examine whether NDBs behave differently compared with commercial banks when it comes to capital market operations. As shown in Table 11, the results are not statistically significant. In other words, NDBs and commercial banks behave similarly as far as capital market operations are concerned.

Table 11 Bank Type and the Maturity of Debt Securities without Control Variables

	(1) Debt security 3m_ratio	(2) Debt security 3_12_ratio	(3) Debt security 1y_ratio	(4) Debt security 1-5y_ratio	(5) Debt security 5y_ratio
NDB	-0.0316	-0.00980	-0.0393	-0.0180	0.0582
	(-0.86)	(-0.43)	(-0.89)	(-0.47)	(1.63)
cons	0.195***	0.168***	0.362***	0.420***	0.218***
	(25.45)	(35.09)	(39.51)	(52.21)	(29.32)
N	2794	2794	2794	2794	2794
N of banks	652	652	652	652	652
Overall *R-square*	0.001	0.000	0.001	0.000	0.001

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5. Conclusion and Future Directions of Research

We study the impact of bank types upon loan maturity in a large sample of 1253 banks across 106 countries during the period from 2011 to 2018. Using a novel hand-collected list of NDBs, we are able to systematically examine the behavior of NDBs in comparison with commercial banks for the first time. Our main finding is that NDBs are generally able to provide long-term loans than commercial banks and NDBs from MICs are more able to lend longer than those in LICs and HICs.

In the future, we can take a step further to empirically examine what explains this

robust empirical pattern. One potential explanation is that NDBs rely on sovereign creditworthiness to issue long-term bonds on capital markets. By contrast, commercial banks primarily rely on short-term household deposits; as a result, they are prone to refinancing risks. Another potential explanation is that NDB bonds have greater value than bonds issued by commercial banks or interbank loans between commercial banks. Hence, commercial banks are more willing to purchase NDB bonds to mitigate liquidity risks than interbank loans. In turn, NDBs are able to lend longer to firms due to the long-term maturity of NDB bonds (Schlarek, Xu and Yan, 2019).

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