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Emerging Markets Review

Cross-sectional determinants of bank performance under deposit dollarization in emerging markets

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ABSTRACT

Dollar-denominated deposits and loans could increase financial fragility in emerging market banking systems. This currency mismatch does not only increase banks' currency risk when the proportion of dollar-denominated loans with respect to local-denominated loans increases but also it increases their clients' default risk if depreciation occurs. This paper investigates the profitability of 36 dollarized banking systems. Results suggest that after controlling for some macroeconomic and institutional variables, dollarization, as the currency mismatch hypothesis suggests, depresses bank performance and lowers bank profitability. Results also show that the effect of institutions more than offsets the negative impact of dollarization on banks' profitability.

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1. Introduction

Banks serve as financial intermediaries accepting commercial and individual deposits (savings) and transferring them in the form of loans. Access to money from a centralized organization (the banks) increases efficiency and reduces transaction costs. Moreover, having a well developed banking system allows for competition that impacts interest rates and has an undoubtedly positive effect on investment activities that generate growth in the economy. Additionally current literature has stressed the importance of banking systems, in particular, bank performance and profitability in contributing to economic development (Levine, 1997).

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Bank performance is determined by the adequate management of the relationship between risk and profitability. In this paper, we are interested in the risks related to the dollarization of liabilities in the banking system. Our aim is to explore the way in which this variable influences bank profitability.

As mentioned earlier, bank profitability is a basic condition not only for the development of the banking systems and their stability but also for economic growth. However, the understanding on drivers of bank profitability in dollarized economies[1] has not been covered in detail in the literature. In particular, the evaluation of bank performance in emerging market economies with high dollar-denominated deposits should recognize the effect of these deposits on their overall performance. In this paper we aim to contribute to the literature by incorporating the effect of deposit dollarization into the existing models on bank performance evaluation using a relatively large sample of emerging market economies.

The main goal in this paper is to study the way in which financial dollarization, also known as asset substitution,[2] affects bank profitability. We analyze the impact of dollar-denominated deposits in the banking system on the profitability of commercial banks. We measure dollarization by the ratio of foreign currency deposits in the system to the overall money supply in the economy, i.e., we use the level of foreign currency deposits in a country's banking system to the M2 money base.[3]

In order to isolate the effects of deposit dollarization on bank profitability, we use several macroeconomic (changes in GDP and inflation), financial (the interest rate spread, and the ratio of loan-loss-provisions to loans and the ratio of equity to total asset-proxies for credit and capital risk) and institutional variables (government efficiency, political stability, regulatory quality, rule of law, voice and quality).

Using data from 36 dollarized countries we show that, as expected, interest rate spreads have a positive and significant effect on bank profitability. However, the magnitude of these effects is smaller than those of other explanatory variables. This is also true with the effect of GDP on bank profitability.

Under different econometric specifications and after controlling for the effect of macroeconomic, financial and institutional variables, we find that dollarization of deposits exert a negative and statistically significant impact on bank profitability with a one-period lag meaning that dollarization of the banking system has a pervasive effect on bank profitability. There are two possible explanations for this last result: First, bank managers in dollarized economies consider the previous period's dollarization ratios in determining current period holdings of cash and other assets, i.e. liquidity and asset management. This explanation also confirms the findings of De Nicolo et al. (2005) who showed that financial instability is higher in dollarized economies meaning that banks will consider their positions in foreign currency to construct their forecasted financial statements that will serve their liquidity and loan positions. This explanation also goes in hand with the findings of Rengifo et al. (2010) who demonstrate that deposit dollarization consistently and significantly exerts a negative impact on financial deepening, even in countries with moderate inflationary processes. In the context of this paper, this implies that during periods of high dollarization banks restrict credit to the private sector (decreasing the financial depth of the economy) preferring to hold more liquid positions or to fund less-risky projects (due to expected increasing financial instability in the future), which decreases their profitability.

Second, as Currency Mismatch literature suggests there is a transfer from exchange risk into default risk in dollarized banking systems[4] i.e. as banks increase their lending in foreign currency to compensate for increases in foreign currency deposits, they increase credit default risk. Thus, observing previous year dollarization in their accounts, bankers would likely increase reserves for possible loan losses next-year which could potentially reduce their profitability.

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[1] Following previous literature, we define a dollarized economy as one where at least the ratio of foreign currency deposits to the M2 ratio is 10% or higher.

[2] De Nicolo et al. (2005) define three generic types of unofficial dollarization depending on the three functions of money: currency substitution (when residents use foreign currency in cash, demand deposits, or reserves at the central bank for transaction purposes); financial dollarization also refers to asset substitution (consists of residents' holdings of financial assets or liabilities in foreign currency) and, real dollarization (where local prices and wages are indexed to the dollar).

[3] We concentrate our study on partially dollarized economies which excludes from our sample countries like Ecuador and El Salvador. In fully dollarized economies, inflation and interest rates are synchronized with those in the US or in the country that issues the currency.

[4] See Section 2 for more on currency mismatch discussion.

Finally, it is important to note that having strong institutions appears to have a significant, positive and stronger effect on bank profitability than the macroeconomic and dollarization variables mentioned before.[5]

The remainder of this paper is organized as follows. Section 2 presents a brief literature review on previous studies about dollarization and bank profitability; Section 3 describes the methodology and the data used in this paper. Section 4 presents the results and, Section 5 concludes and presents future areas of research.

2. Literature review

Banks operating in economies where part of their deposits are denominated in dollars face particular challenges: they face what is known in the literature as currency mismatch risk. A good number of studies have focused on this type of risk to explain some of the recent financial crises (i.e. Goldstein and Turner, 2004). Proponents of this hypothesis[6] argue that the existence of foreign currency denominated or indexed deposit accounts in a developing country's banking system can put stress on the balance sheets of commercial banks during devaluations or sudden depreciations of the exchange rate. In fact, mismatches in banks' balance sheets have been mentioned as possible causes of systemic bank failures for some of the recent banking crisis (e.g. East Asian financial crisis). In the case of the 2008 financial crisis, we can already observe that financial dollarization and the mismatch have played a role in defining regulatory action for emerging market economies. For instance following the 2008 financial crisis regulators in Hungary, Latvia and Poland have tightened eligibility requirements for borrowing in foreign currency and they have encouraged banks to use moral suasion to deter retail level foreign currency borrowing. The authorities in these countries required banks to disclose the exchange rate risks of foreign currency loans to their clients. In countries like Croatia, Kazakhstan and Romania stronger provisioning requirements were also imposed on foreign currency lending compared to local currency lending (Brown and Haas, 2010). Ukraine completely banned foreign currency loans to households in late 2008 and Turkey followed in 2009. In a recent paper Kutan et al. (2012) show that a sudden and strong depreciation of the Turkish lira in 2008–2009 (due to the global financial crisis) was the triggering event that made the Turkish government ban all foreign currency loans to locals.

Chang and Velasco (2001) argue that dollarization of liabilities implies that devaluations have detrimental effects on banks' balance sheets. Banks, looking for ways to hedge against this risk can opt to hedge their currency exposure by using many types of financial derivatives such as foreign currency swaps[7] or, they can decide to make loans also in foreign currency (where permitted).[8] However, by lending in foreign currency to hedge against their liability positions in foreign currency deposits, banks tend to eliminate one risk at the expense of a potentially more dangerous one: their clients' default risk. In an environment where borrowers' abilities to repay are not necessarily indexed to foreign currency values (i.e. salaries earned in local currency) default risk could be substantial and could hurt bank profits or in extreme cases cause them to fail.

Given these scenarios, the ratio of bank loans to foreign currency deposits should play an important role in explaining the vulnerability of banks to these two types of risks (currency and default risks). Banks with low dollar-denominated loan-to-deposit ratios will be more exposed to currency risk in the sense that devaluations or sudden depreciations could create a deficit between what is collected from the local-denominated loans and what is required to buy back the dollars needed to cover their dollar-denominated deposits. Banks with high dollar-denominated loan-to-deposit ratios will be more exposed to default risk in the sense that following devaluations or sudden depreciations of the local currency could increase the number of defaults due to the inability of their clients to pay back their

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[5] Aysun and Honig (2011) stressed the importance of institutional quality in determining the effect of output contractions following sudden stops of capital inflows.

[6] See Burnside et al. (2001) and Mishkin (1996).

[7] There are also other options that have increasingly become available for banks in dollarized economies to use their foreign currency holdings. Aside from lending, commercial banks in dollarized economies can invest their foreign currency holdings in overseas equity markets with more stable returns. Yet these options could be costly for banks or may be subject to strict regulations imposed by the capital regulatory boards of these countries. This topic is left for future research.

[8] Neanidis and Savva (2009) find that the correlation between deposit dollarization and loan dollarization could be as high as 71% for transition economies.

dollar-denominated loans when their income is based on local currency (they will need more local currency to buy the dollars needed to pay their loans).

Berger (1995) is among the first in literature to empirically analyze individual bank performance in the case of the USA. Berger used annual data between 1983 and 1989 for every insured US Commercial Bank and estimated the Capital to Asset Ratio (CAR) and the Return on Equity (ROE) as a function of lagged values of the CAR and ROE as well as a number of control variables to closely examine the capital–earnings relationship in banking. His findings indicated a positive relationship between the two variables and a positive causation running in both directions. This means that banks retain some of their marginal earnings in the form of equity increases.

Barth et al. (1997) analyzed the determinants of bank performance with a sample of over 140 banks in 15 European Union countries, Canada, Japan, Switzerland and the United States, using data from 1993. Their exploratory analysis illustrates a way in which empirical examinations of bank performance might be enriched by taking into account differences in permissible banking activities across countries. Demirguc-Kunt and Huizinga (1999) use bank-level data for 80 countries and estimate bank profitability by using a variety of bank-specific, macroeconomic and regulatory determinants. Their paper provides a good premier for estimations on bank profitability in terms of choice of explanatory variables in analysis. In a more recent study, Athanasoglou et al. (2008) examine the determinants of profitability in the Greek banking system between 1985 and 2001using bank, industry and macroeconomic regressors. Their paper is worth mentioning since they use the GMM estimation for their analysis, to control for possible endogeneity problems.

Up to this point however, the reader can note that the literature related to the topic of this paper, can be distinguished into two (almost) separate venues of research: papers that do research on issues related to banks' profitability from an institutional point of view and research related to the study of dollarization and its impact on the economy in general. In almost all studies that focus on bank profitability we see a common set of bank specific variables used in explaining bank performance such as operating costs, net interest income, equity, capital, overhead expenses, permissible banking activities and the spread, defined as the difference between the interest paid on deposits and interest charged on loans.[9] In addition to bank specific variables, some country-specific macroeconomic variables such as average lending rates, per capita incomes or economic growth are also used in estimating bank profitability.[10]

Evaluation of bank performance in emerging market economies with high dollar-denominated deposits should recognize the effect of these deposits on their overall performance. Banks' profitability is a basic condition not only for banking systems' development and sustainability but also for economic growth. The dollarization aspect is of particular interest in that regard since exchange rate fluctuations or the relative foreign currency exposure of banks should have an impact on banks' performance. In this venue of thought, De Nicolo et al. (2005) show that dollarization has a negative effect on solvency risk for banks in countries with de facto dollarization and, Cespedes et al. (2000) mention the dollarization of liabilities as a cause of the recent financial crises. There have also been some studies that analyze banks' asset quality and profitability under official (full or de jure) dollarization where it has been shown that full dollarization improves asset quality.[11] The only other paper in recent literature that aims to evaluate bank profitability influenced by deposit dollarization is done by Ozsoz (2009) developed for nine transition economies. To the best of our knowledge there has not been a more comprehensive panel analysis of bank performance in the presence of dollar deposits.

3. Methodology and data

Our empirical model constructs on the works of Berger (1995), Demirguc-Kunt and Huizinga (1999), Quispe-Agnoli and Whistler (2006) and Athanasoglou et al. (2008). We measure bank performance

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[9] More in recent times than before, this component is only a part of the total banks' profitability. Day after day, different types of fees and commissions constitute a large part of banks' profits.

[10] For more comprehensive literature on bank profitability studies see Barth et al. (1997), Demirguc-Kunt and Huizinga (1999) and De Nicolo et al. (2005).

[11] Quispe-Agnoli and Whistler (2006) find that in the case of Ecuador and El Salvador full dollarization has no effect on bank profitability but has an effect on liquidity and asset quality.

mainly from the perspective of profitability rather than from a cost efficiency perspective. As illustrated by Olson and Zoubi (2011) for emerging market banks cost efficiency has little impact on profitability and profit efficiency.[12] We have also benefited greatly from De Nicolo et al. (2005) in determining our main estimation model. Our estimation includes a new variable that has not been used in bank profitability estimation before, namely the Aggregate Governance Indicator Dataset developed by Kaufmann et al. (2009). We also include bank specific information at the aggregate level. Following the work of Athanasoglou et al. (2008), we use (EQUITY/TOTAL ASSETS) and (LLP/LOANS) as proxies for capital and credit risk, respectively. Our estimation takes the following reduced form:

$$\frac{\text{EBT}_{i,t}}{\text{TA}_{it}} = \alpha_i + \beta_1 \text{INST}_{i,t} + \beta_2 \text{FORDEP}_{i,t-1} + \sum_{i=3}^{4} \beta_i \text{MACRO} + \sum_{j=5}^{7} \beta_j \text{MICRO} + \varepsilon_{i,t}. \tag{1}$$

We define bank profitability (EBT_{it}) for banks in country i at time t and measure it by the earnings-before-taxes of commercial and savings banks that accept foreign currency deposits.[13] TA_{it} represents the aggregate level of total assets of commercial and savings banks in the banking system in country i at time t. As our dependent variable we use the ratio of these two variables($\frac{\text{EBT}_{it}}{\text{TA}_{it}}$), namely banks' earnings-before-taxes to their total assets rather than just the earnings-before-taxes ratios by themselves since both of these variables are in terms of local currency and, we need to control for the size of the banking system of each individual country. The coefficient α is a country-fixed effect term that captures time-invariant influences specific to country i, INST_{it} is an equally-weighted average of the six institutional quality variables developed by Kaufmann et al. (2009): Government Efficiency, Political Stability, Regulatory Quality, Rule of Law, Voice, and Corruption. The six governance indicators are measured in units ranging from -2.5 to 2.5, with higher values corresponding to better institutional outcomes. We use the Institution variable *INST* in our estimation of banks' profitability because previous research has highlighted the importance of this variable as a determinant of bank performance as shown by Naceur and Omran (2011) and Aggarwal and Goodell (2009) among others. [14] We also know that institutions play an important role as catalysts for dollarization as shown by Levy-Yeyati (2006) (a view also known as the Institutional view in dollarization literature). In this sense weak institutions, which are usually commonplace in economies that suffer from high inflation rates, also contribute to the shallowness of financial systems. Lack of institutional quality raises banks' screening and monitoring costs and makes the estimation of the discount rates used for project evaluation difficult (if not impossible) limiting financing of good investment projects. Moreover, in weak institutions banks' environments become more cautious in their lending activities. In addition to institutional quality, origin of institutional structures (whether they are based on the English Common Law or the French Civil Law) has been shown to explain differences in risk and return in emerging markets (Buchanan et al., 2011). However due to data limitations, our analysis does not cover this aspect of banking systems.

FORDEP_{it-1} is our dollarization variable measured by the ratio of foreign exchange deposits in the banking system of country i at time $t-1$ to the M2 money supply in the same country during the same time frame.[15]

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[12] Although Olson and Zoubi (2011) focus mostly on the MENA region, the countries used in our study are similar to these economies in terms of their baking structures.

[13] Bank profitability is usually measured in literature as the ratio of bank net profits to total assets. However and due to the fact that in this paper our research is based on 36 banking systems from around the world, where tax rates differ from country to country, we use banks' earnings-before-taxes for cross country comparisons. Therefore, we use the ratio of earnings-before-taxes to total assets (to control for banks' size). Another measure on bank performance is the ratio of earnings-before-taxes to equity rather than total assets. The problem that we face in this particular case is that in some countries, governments may be involved in financial intermediation or could give particular guarantees to some of its local banks, which could enable banks to operate with low equity. This could inflate bank return on equity and lead to inconsistent results.

[14] Other economists such as Billmeier and Massa (2009) have also shown the importance of institutions in the development of emerging market systems.

[15] We also used the ratio of foreign currency deposits to total deposits in the banking system as a second measure. This variable was used by De Nicolo et al. (2005). The results were consistent with the results that we present in the paper and are available upon request.

Note that we use the lagged value of foreign currency deposit rates as opposed to contemporaneous rates in our analysis.[16] The rationale for this can be explained by the following:

- Bank managers make financial plans for the next period based on previous periods' data and future expectations about many different variables. Therefore, accounting for changes in deposit dollarization ratios should have at least a one-year time lag as bank managers manage their asset and liquidity positions. Bankers determine at the beginning of a year their baseline portfolio composition and their loan loss reserves that will have a direct impact on their banks' profitability.
- By construct, asset management decisions taken by bank managers regarding the extension of foreign currency loans in an effort to hedge against currency mismatch risk should not be expected to have effects on the bank's financial statements in the same accounting period. There is a time-lag of at least one period before currency mismatch risk shows up as losses on the bank's income statement.[17]

We use MACRO variables $GROWTH_{it}$ and $INFLATION_{it}$ that represent economic growth, calculated as the percentage change in real GDP and, inflation, respectively. For bank specific (MICRO) variables we use (EQUITY/TA) and (LLP/LOANS) as proxies for capital and credit risk. $SPREAD_{it}$ represents the difference between the interest rate banks ask from their clients and the interest rate paid in short term deposits. Finally, we include ε_{it} as a disturbance term with a zero mean and constant variance.

In order to account for possible persistence in banks' profitability, we slightly modify Eq. (1) and include a lag of our endogenous variable.[18]

To estimate our model, we first compute it without the dynamic component using an OLS fixed effect model. For the modified version of Eq. (1) we use the dynamic Generalized Method of Moments (GMM) following the strategy of Arellano and Bond (1991).

Finally to check if the hypothesized channels are operational in our analysis, we also estimated a model on the determinants of the banks' excess reserve and cash holdings explained by the variables used in estimation 1. Our hypothesis is that if banks act cautiously in the presence of high foreign currency liabilities in the system, they can be expected to hold more reserves (with the Central Bank) and cash in more liquid assets than usual. For this reason we compile from the banks' balance sheets data on their cash holdings and holdings with the Central Bank and take a ratio of this variable to their overall loan portfolio. We rewrite Eq. 1 accordingly:

$$\frac{CASH_{i,t}}{LOANS_{it}} = \alpha_i + \beta_1 INST_{i,t} + \beta_2 FORDEP_{i,t-1} + \sum_{i=3}^{4}\beta_i MACRO + \sum_{j=5}^{7}\beta_j MICRO + \varepsilon_{i,t} \qquad (2)$$

where $CASH_{i,t}$ is the sum of bank cash holdings and reserves at the Central Bank in country i in year t and $LOANS_{it}$ represents the total amount of loans banks in country i make in both local and foreign currency in year t. The rest of the variables are the same as the ones in Eq. (1).

3.1. Data

One of the reasons why there has not been extensive research on the effects of dollarization on bank performance is the issue on data gathering. There is not a readily available dataset that includes the level of foreign exchange deposits in the commercial and savings banks of dollarized economies. Most dollarized economies also have developing banking systems, which makes it harder to collect individual or system wide data since the statistics bureaus of central banks have not fully developed their data gathering and archiving functions.

After significant effort we were able to obtain data on the banking systems of 36 dollarized economies as well as on the level of foreign exchange deposits.

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[16] We have also used contemporaneous foreign currency deposit ratios as well as a moving average over a 2 and 4 year window as an explanatory variable. Our results show that the coefficient estimates are not statistically significant and the general model fit deteriorates in the case of the contemporaneous variable. In the case of the moving average estimations, our sample size decreased significantly due to the fact for most countries these data values were not available for more than 5 years. Table 3 in the Appendix provides a detailed list of data availability for each country. The results of these estimations are available upon request.

[17] We have performed tests on other lags but it appears that lag 1 is the most appropriate one.

[18] Even though we find that the inclusion or removal of this variable has no effect in our estimations as reported in Section 4.

Our original banking data is available at the bank level and comes from the balance sheets and income statements found in the BANKSCOPE Database compiled by Bureau van Dijk Electronic Publishing (BvDEP). Our dataset contains an unbalanced panel of 5249 balance sheets and income statements for sixteen (1991–2006) years with an average of 146 balance sheets/income statements for each country and 328 balance sheets/income statements per year. We have the most extensive data available for the year 2004 with 517 balance sheets/income statements and the least data available for 1991 with only 36 balance sheets/income statements. For Mexico, Poland and the Slovak Republic the same data come from OECD's Bank Profitability Dataset. Our banking dataset includes the total before-tax-incomes of all commercial and savings banks in each country, as well as their total assets. Table 1 provides a detailed list of our banking data including the number of balance sheets used for each country and year.

We aggregate individual bank data at the country level. The data on foreign exchange deposits in each country is annualized and comes from two different sources: Central Bank Bulletins and prior work in the literature. For the 14 countries in our sample (38% of all data points) the levels of foreign currency deposits are available in their Central Banks' database, so we use these values. To arrive at the ratio foreign exchange deposits to their M2 money supply in the banking system, we divide these figures after converting them to local currency (if not already done so) by the M2 money supply which is calculated by using line 35 (Quasi-money) of the IMF's IFS database. National definitions of M2 money supply are not taken into consideration in order to provide a uniform measure of the M2. For the remaining 22 countries

Table 1
No. of balance sheets compiled per country and year for bank income data.

COUNTRY	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Albania							1	2	4	4	4	6	8	8	5	5	47
Angola								2	2	2	4	5	7	8	8		38
Argentina	6	9	17	30	34	39	42	70	75	72	77	72	66	66	62	n.a.	737
Armenia						2	4	4	5	5	5	5	5	10	5	5	55
Belarus	n.a.	n.a.	n.a.	1	1	1	4	5	9	10	13	13	15	15	12	n.a.	99
Bolivia	2	2	4	4	4	4	3	3	11	11	11	11	12	12	12	10	116
Bulgaria	1	3	6	10	14	16	19	21	20	24	25	28	30	30	27	14	288
Cambodia						1	1	1	1	2	2	2	3	2	2		17
Costa Rica	1	5	5	5	5	6	7	21	21	21	23	23	21	18	16	n.a.	198
Croatia	n.a.	11	15	17	19	24	28	23	22	27	28	27	27	25	25	13	331
Czech Republic	1	2	4	4	4	4	4	4	3	3	3	3	3	3	3	3	51
Egypt	1	2	4	5	7	7	14	15	30	30	28	26	24	23	2	n.a.	218
Estonia				2	6	9	8	4	4	5	5	6	6	7	6	6	74
Georgia						2	3	6	9	8	8	9	9	9	9	8	80
Hungary	2	5	8	9	13	13	14	15	15	16	14	10	10	15	15	12	186
Jamaica	n.a.	1	1	1	2	3	2	2	3	3	3	7	5	5	5	2	45
Lithuania					5	6	6	5	6	7	7	7	8	8	8		73
Macedonia		2	2	2	6	7	7	7	10	10	11	12	13	15	12	4	120
Mongolia									3	5	6	6	5	6	5	3	39
Moldova							1	3	6	6	7	7	9	13	14		66
Malaysia			1	9	17	16	16	35	36	31	28	29	28	27	27	5	305
Mexico	Not available—obtained from OECD for 1991–2003																n.a
Morocco	3	3	3	3	4	6	7	5	5	6	6	6	6	5	9	9	86
Nigeria	1	3	6	6	13	19	24	24	24	26	29	28	28	28	26	26	311
Nicaragua					5	6	9	12	11	10	10	10	9	7	4		93
Peru	n.a.	5	8	9	11	12	13	14	17	18	15	15	14	14	12	n.a.	177
Philippines	2	2	2	2	2	2	2	3	2					13	14	14	60
Poland	Not available—obtained from OECD for 1993–2003																n.a
Romania				1	3	2	4	13	15	15	14	18	18	21	21	11	156
Russia		1	1	2	3	2	2	3	8	11	11	11	14	19	20	20	128
Singapore	7	7	8	8	9	9	10	8	6	6	5	4	2	8	9	5	109
Slovak Rep	Not available—obtained from OECD for 1997–2003																n.a
Slovenia	n.a.	n.a.	2	4	6	13	13	16	16	16	14	12	14	15	12	2	155
Ukraine	n.a.	n.a.	n.a.	n.a.	n.a.	3	9	11	15	19	21	25	29	30	29	21	212
Venezuela	n.a.	n.a.	n.a.	10	11	12	17	19	29	31	31	29	30	31	27	30	307
Vietnam	2	5	7	9	11	12	13	15	15	16	18	21	21	25	26	16	232
Total	36	74	110	162	217	259	308	396	460	491	502	501	493	517	459	264	5249

Table 2
Definitions, notations and the expected effect of the explanatory variables of Model 1 on Bank Profitability.

Variable	Measure	Definition	Notation	Expected effect
Dependent variable				
	Bank profitability	Earnings-before-taxes of commercial and savings banks to the aggregate level of total assets.	$\frac{EBT_{it}}{TA_{it}}$	
Determinants				
Macrodeterminants				
	Intermediation spread	Difference between average lending and borrowing rate in the country	SPREAD	Positive
	Inflation	Change in CPI	INFLATION	Positive
	Economic growth	Percent change in GDP from previous year	GROWTH	Positive
Microdeterminants				
	Credit risk	Loan loss provisions/loans	LLP/ LOANS	Negative
	Capital	Equity/total assets	EQUITY/ TA	Positive
Other determinants				
	Institutional quality	An equally-weighted average of the six institutional quality variables of Kaufmann et al. (2009): government efficiency, political stability, regulatory quality, rule of law, voice, and corruption.	INST	Positive
	Dollarization	The ratio of foreign exchange deposits in the banking system to the M2 money supply	FORDEP	unknown

(62% of all data points) in the sample, we use the calculated ratios available from Honohan and Shi (2002) and Levy-Yeyati (2006). We exclude fully dollarized economies in our sample such as Ecuador and El Salvador.

Data on inflation and economic growth were obtained through IMF's IFS database. Table 2 provides the definitions and notations of our variables along with their expected effect on bank profitability. A list of the countries included in our analysis along with their data availability is presented in Table 3. Table 4 presents some descriptive statistics on the data we use.

The Emerging Market Banking systems on which our study focuses are relatively more profitable compared to their competitors in developed markets. The average Return on Equity (ROE) ratio in our sample is 11% while the average Return on Assets (ROA) is 1.4% which is relatively much higher than the same ratio for developed banking systems (for instance the ROA for US banks stood at 0.88% for 2011). This high profitability of our sample makes sense considering the relatively high average spread between the lending and deposit rates for the banking systems in our sample which stands at 11.6 percentage points. The Loan-loss reserve ratio which is representative of the banks' loan quality stands at an average of 3% for the group. On average the ratio of foreign currency deposits to the overall M2 money supply in our sample is 32% suggesting that the banking systems we study are highly dollarized on average. We also observe that these economies are also suffering from relatively high inflation. The average inflation rate in our sample is around 28%. Another important characteristic of our sample is that it consists of countries with low institutional quality and high growth rates; the equally weighted average of the institutional quality index is a negative 0.12 for our sample while the median annual growth rate in our sample is 4.7%.

4. Estimation results

In this section we present the way in which we analyze the data using Eqs. (1) and (2). First of all we checked for the stationarity of the data using a unit root test for unbalanced panels (Fisher test). The results show that the null of non-stationarity is rejected at 5% for all the variables. Secondly, for the static model as presented in Eq. (1), we use the Hausmann test to test the validity of the Fixed Effects model. The $\chi^2(8) = 142.29$ and the $p = 0.00$ showed that the differences in the coefficient estimates using Random Effects and Fixed Effects is systemic. Thus, this supports the use of the Fixed Effects model.

Table 3
List of countries in the sample and data availability.

Country	FORDEP	INCOME	INST
Albania	94-06	99-06	96-06
Angola	95-00	98-05	96-06
Argentina	81-04	94-05	96-06
Armenia	92-04	96-06	96-06
Belarus	00-06	96-05	96-06
Bolivia	80-04	91-06	96-06
Bulgaria	91-04	91-06	96-06
Cambodia	93-04	96-05	96-06
Costa Rica	87-06	93-05	96-06
Croatia	93-06	91-06	96-06
Czech Republic	93-04	91-06	96-06
Egypt	91-06	99-06	96-06
Estonia	94-06	95-06	96-06
Georgia	94-99	96-06	96-06
Hungary	03-06	94-06	96-06
Jamaica	98-05	92-06	96-06
Macedonia	95-04	92-06	96-06
Mongolia	92-99	99-05	96-06
Moldova	93-06	98-05	96-06
Malaysia	96-04	98-06	96-06
Mexico	91-02	86-03	96-06
Morocco	96-03	91-06	96-06
Nigeria	94-04	92-06	96-06
Nicaragua	95-04	95-05	96-06
Peru	80-04	92-05	96-06
Philippines	82-04	90-06	96-06
Poland	98-05	93-03	96-06
Romania	90-04	94-06	96-06
Russia	93-00	94-06	96-06
Singapore	93-04	91-06	96-06
Slovak Rep.	93-04	97-03	96-06
Slovenia	94-05	93-05	96-06
Ukraine	92-05	96-06	96-06
Venezuela	98-01	94-06	96-06
Vietnam	92-06	92-06	96-06

As noted by Arellano and Bond (1991), if we try to use the same technique for the dynamic model, i.e. if we include a lag of the endogenous variable as an explanatory variable, the results of the Fixed Effect model will be biased and inconsistent. Thus, for this specification of the model we use the GMM model

Table 4
Descriptive statistics.

	$\frac{EBT}{TA}$	SPREAD	INST	FORDEP	INFLATION	GROWTH	LLP/LOANS	EQUITY/TA
Mean	0.014	11.593	−0.122	0.322	27.997	4.808	0.031	0.113
Median	0.014	7.940	−0.248	0.284	6.991	4.752	0.019	0.097
Standard deviation	0.018	17.603	0.672	0.181	211.631	5.613	0.047	0.094
Skewness	−1.378	6.558	0.365	0.444	18.102	3.613	4.453	4.234
Kurtosis	14.561	65.934	2.596	2.177	348.198	43.279	31.070	29.167
No. of observations	421	446	418	377	486	463	357	420

Descriptive statistics for estimations on bank profitability. This includes 5249 balance sheets from 36 countries for 16 years between 1991 and 2006. $\frac{EBT}{TA}$ is the earnings-before-taxes of commercial and savings banks to the aggregate level of total assets; SPREAD is the difference between average lending and borrowing rate in the country; INST represents institutional quality and is an equally-weighted average of the six institutional quality variables of Kaufmann et al. (2009): government efficiency, political stability, regulatory quality, rule of law, voice, and corruption. FORDEP is the ratio of foreign exchange deposits in the banking system to the M2 money supply; INFLATION is the change in the CPI; GROWTH is the percent change in the real GDP from previous year; LLP/LOANS is the loan loss provisions/loans; EQUITY/TA is the ratio of bank's equity to its total assets. Inflation rate, growth and spread are in percentages.

Table 5
Cross sectional determinants of bank profitability—all countries.

Dependent Variable: $INCOME_{it}/TA_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(8)	(9)
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	GMM	GMM	GMM
Time period	1990–2006	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006	1997–2006	1997–2006	1998–2006
C	0.014***	0.015***	0.025***	0.023***	0.015***	0.018***	0.013**			
	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)			
SPREAD	0.000*	0.000*	0.000*	0.000***	0.000***	0.000***	−0.000***	0.000*	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
INST		0.011***	0.026***	0.025***	0.033***	0.036***	0.017**	0.055*	0.060**	0.004
		(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.034)	(0.030)	(0.012)
FORDEP			−0.031***	−0.027***	−0.016*	−0.012	−0.014	−0.026**	−0.014*	−0.004
			(0.002)	(0.009)	(0.010)	(0.010)	(0.009)	(0.012)	(0.008)	(0.013)
INFLATION				−0.000***	0.001***	0.000***	0.000*	0.000***	0.000***	0.000***
				(0.0003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GROWTH					0.000***	0.000***	0.000***	0.000*	0.000***	0.000
					(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLP/LOANS						−0.083***	−0.022		−0.090**	−0.072
						(0.027)	(0.036)		(0.045)	(0.049)
EQUITY/TA						−0.022**	0.106***		−0.017	0.091***
						(0.012)	(0.024)		(0.059)	(0.033)
FORDEP* volatility							−0.011*			−0.002
							(0.006)			(0.005)
Adj. R²	0.22	0.21	0.40	0.44	0.50	0.54	0.62			
Number of countries	36	36	36	36	36	36	22	35	35	22
Number of observations	417	351	289	289	272	250	143	219	199	123
S.E. of regression								0.015	0.012	0.010
Sargan-test								χ²(219)=36768.696	χ²(199)=29455.60	χ²(123)=10140.17
AR (1)								z=−0.084	z=−0.056	z=−0.013
								p=0.211	p=0.428	p=0.883
AR (2)								z=−0.206	z=−0.176	z=−0.066
								p=0.004	p=0.031	p=0.748

Source: Bankscope, IMF-IFS, Kaufmann et al. (2009) and author's calculations. SPREAD: interest income—interest expense, INST: institutional quality index, FORDEP: foreign currency deposits in the banking system in year $t-1$ to M2 in year $t-1$. GROWTH: growth of real GDP per capita, LLP/LOANS: the loan loss provisions/loans, EQUITY/TA: the ratio of bank's equity to its total assets, VOLATILITY: volatility dummy calculated based on the Standard deviation of the nominal effective exchange rate. This takes the value of 1 if greater than 10 and 0 otherwise. In estimations (7), (8) and (9) cross sections are fixed (first differences), thus an intercept does not appear. Results for the lag of the dependent variable $(\frac{EBT(-1)}{TA(-1)})$ are not reported in estimations (7), (8) and (9) since they are not significant. * significant at 10%; ** significant at 5%; *** significant at 1%.

following the technique proposed by Arellano and Bond (1991). As suggested by these authors we use all possible lags of our dependent variable plus lagged values of all regressors as instruments. In this way we obtain parameter estimates that are consistent and efficient.

We have 34 countries that we use in our dynamic panel GMM model, that increases our confidence in the consistency and efficiency of our estimates. Following Athanasoglou et al. (2008) who performed the Sargan test for over-identifying restrictions, we verified that capital is better modeled as an endogenous variable and that credit risk is better modeled as a predetermined regressor. Thus we do not use the lags of capital as instruments. For this GMM specification we also tested for time effects and found none.

For the static model we use a step-type regression analysis and developed 10 models; from these 10, Models (7) and (8) present the results of using the dynamic GMM panel specification. Table 5 presents the results of all these models.

In model (1) we include the interest rate spread as the only regressor of bank profitability and observe that even though the effect is significant its magnitude is very small. This result holds for all model specifications.

In models (2) through (7) we add the institutional quality index (INST). As expected the sign of the coefficients are positive and their values are not only significant but also large in magnitude. Moreover, these coefficients are always larger than those of the economic growth (GROWTH) variable and the deposit dollarization variable (FORDEP).

Starting in model (3) we include our lagged dollarization variable (FORDEP). As we can see in Table 5, dollarization has a negative and significant effect on banks' profitability under all scenarios (including the GMM ones presented in models (7) and (8)). This effect is robust to the inclusion of other control variables like inflation, GDP growth and to the two bank specific variables that we use (capital and credit risk). This result implies that dollarization (lagged one period) has a negative effect on banks' profitability.[19] This finding confirms our initial thinking regarding currency mismatch risk and its effect on bank profitability. Banks' current profitability depends on dollarization ratios experienced during the previous period since losses and earnings from loans and deposits are usually carried onto their financial sheets with a one-year lag. [20]

The effect of inflation appears to be positive, and significant but very small for all specifications. This result goes in hand with the findings of Athanasoglou et al. (2008). Growth effect on profitability is positive, significant and small. We include the credit risk variable (LLP/Loans) in models (6) and (8). The negative sign of this variable implies that as credit risk increases (credit quality deteriorates) banks profitability decreases due to higher loan loss provisioning with respect to total loans. Of course, banks' profitability should also be affected by actual defaults. Finally, we include the capital variable (equity/total assets) in models (6) and (8). The sign is not the expected one but it is not significantly different from zero under the GMM specification. The one-period lagged profitability ratio in estimations (7) and (8) is not significant in our estimations, therefore results are not reported.[21]

An important finding in this paper is that the coefficients of the INST variable more than offset the negative impact of dollarization on banks' profitability. These results tell us that institutional quality (which encompasses Government Efficiency, Political Stability, Regulatory Quality, Rule of Law, Voice, and Corruption) is fundamental for banks' profitability. That is, countries with strong institutions reduce banks' screening and monitoring costs, which makes the estimation of the discount rates used for project evaluation easier and allows financing of good investment projects to grow (financial deepening increases). In this sense, the interest rates in countries with weak institutions include an *institutional premium* to cover the banks against *institutional risks*.

Institutions protect creditors rights and, as shown by Galindo and Micco (2005), Djankov et al. (2005), Dehesa et al. (2007) and Rengifo et al. (2010) financial deepening and development can be explained to a great extent by the protection of creditors. In this sense, we have extended their results and showed that institutions not only contribute to financial deepening and development but also enhance banks' profitability.

In Table 5 we can also observe that increasing the number of variables reduces our number of observations. This is due to the nature of our data where not all variables are present for all 36 (34)

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[19] Again, we have also used contemporaneous dollarization as an explanatory variable. Our results show that the coefficient estimates are not statistical significant and the general model fit deteriorates. These results are available upon request.

[20] Banks earn interest (and other income) from operations carried out in the previous year.

[21] We also observe that our results do not change quantitatively or qualitatively when we remove this variable from our estimations.

countries that we analyze in the static (dynamic) models. However, even though the number of observations drops from 417 for Model (1) to 191 in Model (8), the sample size is large enough for us to be confident that our parameter estimates are unbiased and efficient.

Finally, for Models (7) and (8) we present the Arellano–Bond test for the average autocovariance in the residuals of orders 1 and 2. The null hypothesis is that there is no autocorrelation of a given order. In our case, we can see that there is no autocorrelation of the errors in order 1 or order 2. This gives us additional support for robustness of our results.

An additional aspect that we also include in our specification is the one related to the idea that banks should protect their balance sheets from the perverse effects of large depreciations. In this sense what we expect is that banks should be more cautious in environments where large depreciations have taken place. We check for this relationship by interacting lagged exchange rate volatility with the magnitude of deposit dollarization.[22]

The results in models (6a) and (9) in Table 5 are consistent across both models and indicate that when nominal exchange rate volatility increases in a dollarized economy, banks' profitability decreases. Another important aspect to note is that in both models the sign of the impact of deposit dollarization is unchanged, although it loses significance in model (9). We can argue that this is due to the reduced sample size as a result of the inclusion of the volatility variable. Inclusion of the volatility variable reduced our sample of countries from 36 to 22 in the OLS estimation and from 35 to 22 in the GMM estimation. Similarly, the number of observations went down from 250 to 143 in the OLS specification and from 199 to 123 in the GMM case.

Finally, we test to see if in highly dollarized economies banks become more risk averse and estimate Eq. 2 on our dataset. Results are presented in Table 6. We use banks' cash and cash related assets divided by their total assets as our endogenous variable. The explanatory variables used here are the interest rate spreads, institutional quality index, inflation, deposit dollarization and equity over total assets. Again, we use a dynamic GMM technique.

The results presented in Table 6 support our previous findings. If banks' interest rate spreads increase (meaning that the difference between the interest rate they ask for the loans and the interest rate they pay for the deposits increase), their cash holdings decrease. The same effect can be observed when the quality of institutions improves, meaning that banks prefer to hold less cash when they are in countries with strong institutions. An increase in institutional quality makes banks less risk averse increasing their lending activities (financial deepening) which also increases their profitability. On the other hand, when deposit dollarization increases we can clearly see that banks' cash holdings increase, which can imply that banks become more risk averse. As previously noted, the effect of institutional quality offsets the impact of dollarization on banks cash holdings.

5. Conclusion

Financial institutions in dollarized economies accept foreign currency deposits and usually make loans in foreign currencies in an attempt to protect themselves from the exchange rate risk they are exposed to. This practice however does not provide a hedge against exchange rate fluctuations; it only substitutes loan default risk in place of exchange rate risk leaving banks still vulnerable to fluctuations in the value of foreign currency. Moving from this assumption, we have set out to study the performance of commercial banks in 36 dollarized economies to see what effect the existence of dollar deposits within the banking system has on the performance of banks.

We used the level of foreign currency deposits in a country's banking system to the M2 money base as our dollarization measure and we estimated bank performance using bank profits before taxes; adjusted by the total assets as the dependent variable. In our modeling we have followed previous research on bank performance estimation and used not only bank and industry specific variables such as credit quality measured by the ratio of bank loan loss provisions to overall loans and bank capital ratio (measured simply

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[22] We measure volatility as the standard deviation of the nominal effective exchange rate calculated over moving four-year windows. We tested several other windows and the results were consistent. Results are available upon request.

Table 6
Determinants of Banks' Cash Holdings.

Dependent variable:	$CASH_{it}/LOANS_{it}$	
	(10)	(11)
Method	GMM	GMM
Time period	1997–2006	1997–2006
$CASH(-1)_{it}/LOANS(-1)_{it}$	−0.139***	−0.177***
	(0.001)	(0.005)
SPREAD	−0.001***	−0.001***
	(0.000)	(0.000)
INST	−0.020***	−0.025***
	(0.001)	(0.004)
FORDEP	0.041***	−0.074***
	(0.002)	(0.008)
INFLATION	0.0004***	0.0004***
	(0.000)	(0.000)
GROWTH	0.0001***	0.0001***
	(0.000)	(0.000)
EQUITY/TA		0.261***
		(0.021)
Number of countries	35	35
Number of observations	215	215
S.E. of regression	0.115*	0.112**
Sargan-test	$\chi^2(215)=6519.57$	$\chi^2(215)=6521.30$
AR(1)	$z=-0.076$	$z=-0.054$
	$p=0.25$	$p=0.428$
AR(2)	$z=-0.064$	$z=-0.084$
	$p=0.33$	$p=0.334$

Source: Bankscope, IMF-IFS, Kaufmann et al. (2009) and author's calculations. $CASH_{it}$: the sum of bank cash holdings and reserves at the Central Bank in country i in year t. $LOANS_{it}$: the total amount of bank loans in country i made in both local and foreign currency in year t. SPREAD: interest income−interest expense, INST: institutional quality index, FORDEP: foreign currency deposits in the banking system in year $t-1$ to M2 in year $t-1$. INFLATION: change in CPI, GROWTH: growth of real GDP per capita, LP/LOANS: the loan loss provisions/loans, EQUITY/TA: the ratio of bank's equity to its total assets, VOLATILITY: volatility dummy calculated based on the standard deviation of the nominal effective exchange rate. This takes the value of 1 if greater than 10 and 0 otherwise. In estimations (7), (8) and (9) cross sections are fixed (first differences), thus an intercept does not appear. Results for the lag of the dependent variable ($\frac{EBT(-1)}{TA(-1)}$) are not reported in estimations (7), (8) and (9) since they are not significant. * significant at 10%; ** significant at 5%; *** significant at 1%.

as equity to total assets) but also country specific macrovariables including inflation, economic growth, average intermediation spread and a measure of institutional quality to which we have added dollarization. We have used not only a fixed effects model but also a dynamic GMM model to see the robustness and consistency of our results.

Under all econometric specifications, the results of our estimations suggest that deposit dollarization has a negative impact on banks' profitability with a time lag. While current period dollarization ratios do not seem to have any significant effect on banks' overall performance in an economy, previous period dollarization ratios have a robust and significant effect on bank profitability. The rationale for this can be explained by bank managers' adaptive expectations, and the fact that bank managers plan for the current period usually by reflecting on previous period data. Therefore, accounting for changes in deposit dollarization ratios should have at least a one-year time lag as bank managers manage their asset and liquidity positions. Bankers determine at the beginning of a year their portfolio composition and the level of their loan loss reserves that will have a direct impact on their banks' profitability. This result is confirmed in estimations regarding banks' cash holdings; bankers prefer to hold more liquid or less-risky portfolio positions in the presence of high deposit dollarization decreasing lending and reducing in this way their profitability.

Another interesting finding in our analysis refers to the prominent effect of institutions on banks' profitability and cash holdings. Banks in countries with strong institutions more than offset the negative

impact of dollarization on their profitability and hold lower cash positions. This finding is robust in all models tested.

In summary, even though dollarization negatively and consistently affects banks' profitability either directly or through increased bank cash holding positions, the impact of institutional quality seems to be more important. Thus, policy makers may deal with the negative effects of dollarization on bank profits by improving their institutions' quality (Government Efficiency, Political Stability, Regulatory Quality, Rule of Law, Voice, and Corruption).

Acknowledgments

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