

Financial Dollarization and International Reserve Holdings: Cross- Country Evidence from Emerging and Developing Economies

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The Effects of Inflation on Banks' Balance Sheets: Evidence from Emerging Markets

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Abstract

This paper examines whether deposit dollarization conditions the relationship between international reserve holdings and their conventional determinants in developing economies. Using an unbalanced panel of approximately 130 countries over 2000–2022, we re-estimate benchmark reserve-demand specifications, compare predictive patterns across low-, intermediate-, and high-dollarization groups using Random Forest models, and provide a complementary assessment based on country fixed-effects regressions. The results indicate that the association between reserves and their determinants varies with deposit dollarization. In more dollarized environments, financial depth, banking-sector liquidity, and short-term external liabilities display greater relevance, while trade-related variables become comparatively less prominent. These patterns are consistent with a precautionary financial stability motive for holding reserves in economies where domestic liabilities can be converted into foreign currency. The findings suggest that reserve-demand models benefit from explicitly considering the currency composition of domestic financial liabilities.

Keywords: International reserves, international reserve holdings, reserve accumulation, financial dollarization, emerging market economies, precautionary demand for reserves, foreign-currency deposits.

JEL Classification: F31, F32, F41, E44, E58, C33.

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1. Introduction

The accumulation of international reserves has been a widely studied topic in economic literature. Various motivations, including mercantilist considerations, precautionary motives, and the maintenance of exchange rate regimes, among others, have been proposed to explain the historical trend in reserve holdings. However, far from reaching a consensus across these different perspectives, the literature reveals a broad range of potential determinants, suggesting that this phenomenon should not be approached as a homogeneous and static issue.

In recent years, several authors have highlighted the rapid growth of international reserves. Developing economies are estimated to have more than doubled their reserve holdings between 1980 and 2020 (Benigno et al., 2022), while global international reserves increased by approximately USD 12 trillion between 1990 and 2023 (Jung, 2026). This trend has been extensively documented in the literature (Beck and Rahbari, 2011; Bussière et al., 2015; Céspedes and Chang, 2020), underscoring the growing importance of reserve accumulation as a policy instrument for mitigating a wide range of macroeconomic risks.

Regarding this, Cheung and Ito (2009) show that the observed increase in reserve holdings reflects an evolutionary process associated with globalization, whereby the determinants of reserve holdings change in response to emerging financial needs, shifting expectations, and evolving governance frameworks. Additionally, Delatte and Fouquau (2011) highlight the substantial growth of international reserves and argue that traditional explanations are insufficient to fully account for this phenomenon. Consequently, they emphasize the need for new methodological approaches and determinants capable of capturing the evolving patterns observed in the data.

Therefore, it is important to recognize that the determinants of international reserve holdings may be shaped by a variety of contextual factors, including commercial, financial, fiscal, and even governance-related conditions. Although the literature has empirically examined several sets of these determinants, a relatively underexplored perspective concerns the effects of dollarization on reserve accumulation processes. One of the authors investigating this issue is Gonçalves (2007), who analyzes the optimal level of international reserves in a highly dollarized economy and finds that fiscal vulnerabilities associated with high degrees of dollarization may increase the need for larger reserve holdings. This perspective is particularly relevant, as the macroeconomic and financial structures characterizing economies affected by dollarization may substantially reshape both the determinants of international reserves and the magnitude of their effects.

In addition, the literature on dollarization has documented that it is a widespread phenomenon across countries, albeit with varying degrees of incidence. Recent studies suggest that it is particularly prevalent in emer-

ging and developing economies, where it may generate distortions through multiple economic channels (Agur, 2023; Ajide et al., 2019; Castillo et al., 2024; Ferrante and Gornemann, 2022).

Given that financial dollarization may generate different macroeconomic risks and vulnerabilities while altering the transmission of economic channels, it is important to determine whether international reserve holdings continue to be driven by the determinants commonly identified in the literature or whether, under different degrees of deposit dollarization, some of these determinants lose explanatory power. Accordingly, this paper aims to examine whether the determinants of international reserve holdings vary according to the degree of deposit dollarization. Specifically, we hypothesize that the determinants identified in the literature do not exert a uniform influence on reserve holdings across economies with different levels of dollarization.

We first divide country-year observations into three dollarization environments using pooled quintile cutoffs: low dollarization (Q1), intermediate dollarization (Q2–Q4), and high dollarization (Q5). We then revisit the specifications proposed in several seminal models of international reserve holdings by interacting each explanatory variable with our deposit dollarization measure to assess whether their effects vary with the degree of dollarization. Each specification is first estimated using the full sample and subsequently for each dollarization quintile, allowing us to identify potential heterogeneity in the determinants of reserve holdings.

We next estimate Random Forest models separately for the full sample and the three dollarization groups to explore nonlinear predictive patterns, incorporating financial, mercantilist, fiscal, and governance-related determinants. Based on the results, we determine the predictive importance of each variable and select those that make the greatest contribution. Next, we specify a first high-dimensional fixed-effects model using the variables identified by the machine learning model as having more predictive power to capture the effects in a linear framework. Later, we use some of the RF variables that are also highlighted in the literature, and we add several other variables, such as peg type, to conduct a robustness test under a second fixed-effects model.

The findings indicate that traditional motivations for international reserve holdings identified in the literature remain both valid and statistically significant. However, the precautionary motive associated with financial considerations emerges as a highly relevant determinant, even in contexts where mercantilist-related variables lose much of their explanatory power. More specifically, the results reveal that at higher levels of dollarization, financial factors become increasingly important, both within the proposed econometric framework and in the predictive importance rankings generated by the Random Forest model.

The remainder of this paper is organized as follows: Section 2 presents related literature; Section 3 explains the methodology and data used; Section 4 reports the results; and Section 5 concludes.

2. Related Literature

International reserves are a key policy instrument for developing economies, as they provide insurance against external liquidity shortages, abrupt reversals in capital flows, and balance-of-payments crises. The literature usually distinguishes between two main motives for reserve holdings: the mercantilist motive and the precautionary motive. The mercantilist view argues that reserves are accumulated to limit exchange rate appreciation and preserve external competitiveness, particularly in economies following export-led growth strategies. This interpretation is emphasized by Dooley et al. (2005), Aizenman and Lee (2007), and Delatte and Fouquau (2011). However, the empirical literature generally finds stronger support for the precautionary motive. Under this view, reserves act as a buffer against sudden stops, financial stress, short-term external debt pressures, and capital account volatility. Ranci re and Jeanne (2006), Cheung and Ito (2009), Obstfeld et al. (2010), Beck and Rahbari (2011), Buss  re et al. (2015), Calvo et al. (2012), and C  spedes and Chang (2020) provide evidence that financial and external vulnerability indicators are central determinants of reserve holdings.

A related strand of the literature examines financial dollarization, understood as the use of foreign currency in domestic financial transactions, savings, credit, and pricing. Levy-Yeyati (2006) distinguishes between official dollarization, where foreign currency is legally adopted, and unofficial or *de facto* dollarization, where foreign currency circulates alongside the domestic currency. Partial dollarization is especially relevant in emerging economies, where foreign-currency deposits and credit coexist with domestic-currency instruments, as documented by Borensztein and Berg (2001). The literature identifies several drivers of dollarization, including inflation history, weak confidence in the domestic currency, exchange rate risk, limited policy credibility, and shallow domestic financial markets. Reinhart et al. (2003), Levy-Yeyati (2006), and Castillo et al. (2024) emphasize that dollarization may persist even after macroeconomic stabilization, a phenomenon commonly referred to as dollarization hysteresis.

Theoretical and empirical studies also interpret dollarization through portfolio, insurance, and banking channels. The minimum variance portfolio framework developed by Ize and Levy-Yeyati (1998, 2003) shows that agents allocate wealth across currencies depending on the relative volatility of inflation and the real exchange rate. Related studies extend this logic to deposit dollarization, household borrowing, and banking-sector balance sheets. Another strand views foreign-currency holdings as a hedge against crises and depreciation risk, where households, firms, and banks use dollar-denominated instruments as insurance mechanisms against macro-financial instability. Contributions by Aiba et al. (2018), Bocola and Lorenzoni (2020), Christiano et al. (2021), and Dalgic (2024) are consistent with this interpretation. Dollarization also has important macroeconomic and financial implications: it can weaken monetary transmission, increase exchange rate pass-through, amplify balance-sheet vulnerabilities, and constrain policy flexibility, although the magnitude of

these effects depends on institutional credibility and the strength of the policy framework.

These features suggest that dollarization may also affect the demand for international reserves. In financially dollarized economies, foreign-currency deposits and liabilities increase liquidity and solvency risks, making traditional reserve adequacy benchmarks potentially insufficient. Ozyildirim and Yaman (2005) show that foreign-currency deposits are a relevant determinant of reserve needs in Turkey, while Gonçalves (2007) reaches a similar conclusion for Uruguay, arguing that conventional benchmarks such as short-term debt coverage or import coverage may fail to capture the reserve needs of dollarized financial systems. More recently, Andreasen and Nuguer (2025) examine Peru and show that foreign-currency reserve requirements affected credit heterogeneously across banks, depending on their exposure to foreign funding. These studies suggest that the interaction between reserve holdings, foreign-currency liquidity, and financial dollarization is central for understanding reserve adequacy in partially dollarized economies.

Additionally, financial dollarization may condition reserve demand through a domestic portfolio-shift and foreign-currency liquidity channel. Under heightened uncertainty or depreciation expectations, residents may substitute foreign-currency assets for local-currency deposits and securities. If this reallocation involves cash withdrawals, transfers abroad, or conversions through the foreign-exchange market, it places pressure on both bank liquidity and international reserves. A related vulnerability arises from the stock of existing foreign-currency deposits: although banks may be matched in accounting terms, they remain exposed to systemic foreign-currency withdrawals that the central bank cannot accommodate by issuing domestic money. International reserves therefore provide liquidity insurance against both the conversion of local financial liabilities into foreign currency and runs on liabilities already denominated in foreign currency (Chang and Velasco, 2001; Levy-Yeyati, 2006; Obstfeld et al., 2010).

This mechanism provides a direct link between deposit dollarization and the variables emphasized in the financial stability literature. A larger banking system, greater banking-sector liquidity, and larger short-term liabilities represent more substantial potential claims on foreign-currency resources when domestic portfolios are highly dollarized.

This paper contributes to the literature by examining whether financial dollarization changes the determinants of international reserve holdings. While previous studies have analyzed reserve demand, dollarization, or reserve adequacy in dollarized economies separately, this paper links these strands by assessing whether traditional mercantilist and precautionary motives vary across different levels of dollarization. In doing so, it shows that reserve holdings should not be treated as a homogeneous process across emerging and developing economies, particularly when foreign-currency deposits are a persistent feature of the domestic financial system.

3. Related Literature

3.1. Data

The data used in this analysis were obtained from several sources, including the World Bank’s World Development Indicators (WDI), the External Wealth of Nations database compiled by Lane and Milesi-Ferretti (2018), and an updated version of Levy-Yeyati’s (2021) financial dollarization dataset. The main variables used in the empirical analysis are summarized in Table 1, which reports descriptive statistics and sample coverage for the country-year observations included in the baseline dataset. Annex 1 has a full description of the variables and their sources.

The dataset is structured as an annual country-level panel. Country and time coverage vary across variables, but the baseline sample covers approximately 130 emerging market and developing economies over the period 2000-2022, and each country reports at least one observation of the dollarization variable. Because data availability differs across sources, countries, and variables, the empirical analysis relies on an unbalanced panel. This structure allows the analysis to preserve the maximum number of available observations while avoiding unnecessary sample restrictions. At the same time, the unbalanced nature of the panel implies that the effective estimation sample may vary across specifications depending on the set of controls included.

Following the relevant literature and the classification proposed by Cheung and Ito (2009), the explanatory variables are grouped into five broad categories. The first category includes traditional macroeconomic controls, such as population, inflation, output, monetary depth, and trade-related variables. The second category comprises financial and external financing variables, including short-term external debt, foreign direct investment, capital flows, and banking-sector liquidity indicators. The third category covers institutional variables, including governance and regulatory quality measures. The fourth category includes policy and country-specific indicators, such as exchange rate regimes and fiscal policy frameworks. The fifth category contains variables related to international reserve holdings.

Financial dollarization data are based on Levy-Yeyati (2021), who constructed a cross-country database covering credit and deposit dollarization. For this study, the deposit dollarization series was updated using official national sources, including central banks and banking supervisory authorities. Deposit dollarization is measured as the ratio of foreign-currency deposits to total deposits:

$$Deposit\ dollarization_{i,t} = \frac{Foreign\ currency\ deposits_{i,t}}{Total\ deposits_{i,t}}$$

Where i denotes country and t denotes year. The resulting variable ranges between 0 and 1, with higher values indicating a greater share of deposits denominated in foreign currency. To describe cross-country heterogeneity, the data are also presented by quintiles of deposit dollarization in Annex 2.

Table 1. Descriptive statistics

Variable	Abbreviation	N	Mean	St. Dev.	Min.	Max.
Population	<i>log_pop</i>	2276	15.50	2.24	9.78	21.07
M2 as a share of GDP (%)	<i>log_m2_gdp</i>	2054	3.84	0.76	1.07	9.50
Bank liquid reserves to bank assets ratio	<i>log_bank_liquid_ratio</i>	1806	2.89	0.75	-0.71	4.83
Short-term debt in USD	<i>log_stdebt_usd</i>	1672	24.94	2.97	6.36	32.55
Imports as a share of GDP (%)	<i>log_imports_gdp</i>	1921	3.74	0.47	2.33	5.25
Regulatory Quality	<i>Regulatory_Quality</i>	2142	-0.20	0.68	-2.08	1.69
Exchange rate CU per USD	<i>log_exchange</i>	2259	3.18	2.71	-2.43	10.41
Exchange rate peg (binary)	<i>pegtype</i>	2083	0.50	0.50	0.00	1.00
Exchange rate volatility	<i>volatility</i>	2255	0.07	0.24	0.00	9.37
Deposit dollarization (%)	<i>dollar_dep</i>	2276	0.37	0.29	0.00	1.00
Total international reserves (including gold) as a share of GDP (%)	<i>log_r</i>	2176	2.74	0.78	-2.26	5.04
Crisis (binary)	<i>all_crisis</i>	2015	0.30	0.46	0.00	1.00
Real GDP per capita in USD	<i>log_real_gdp_pc</i>	2263	8.21	1.02	5.53	10.39
Chinn-Ito Index	<i>kaopen</i>	2197	0.25	1.46	-1.93	2.29
Total trade as a share of GDP (%)	<i>log_trade</i>	1921	4.33	0.46	2.73	5.85
Net liabilities as share of GDP (%)	<i>net_liab_gdp</i>	2271	509.11	5700.30	-75536.27	22807.23
Portfolio equity liabilities as a share GDP (%)	<i>pel_gdp</i>	2272	0.00	0.00	0.00	0.01
Rule of Law	<i>Rule_of_Law</i>	2174	-0.26	0.71	-1.92	1.80
Latin America (binary)	<i>LAC</i>	2276	0.26	0.44	0.00	1.00

Note: As for the literature comparison, sources, transformations, and methodological construction of the variables were replicated to the furthest possible extent. Nevertheless, changes in the underlying data sources and constraints on data availability may limit full replication in some cases.

Table 1 shows substantial heterogeneity across countries and over time. Deposit dollarization is sizeable, with foreign-currency deposits representing, on average, 37 percent of total deposits, but dispersion is large, ranging from zero dollarization (0%) to fully dollarized (100%). The data also reveal important differences in financial and banking-sector depth. External exposure is similarly heterogeneous, with large cross-country differences in short-term external debt and import intensity, capturing variation in external financing needs and trade openness.

The sample also displays broad variation in institutional quality, exchange rate regimes, and international reserve holdings. The exchange rate peg indicator suggests that roughly half of the observations correspond to some measure of pegged regimes. International reserves also differ substantially across economies, which is particularly relevant in financially dollarized systems where foreign-currency deposits may increase liquidity risks and strengthen precautionary reserve demand. Overall, this variation provides a useful empirical setting to examine the relationship between deposit dollarization and international reserves while controlling for macroeconomic, financial, institutional, and policy-related factors.

3.2. Model specifications

In order to assess the implications of financial dollarization on international reserve holdings, this paper's methodology encompasses different econometric and machine learning approaches.

3.2.1. Literature comparison

The literature-based models follow seminal contributions by widely cited and recognized authors in the field of international reserve holdings. These models serve as benchmarks to compare the results of this study with established empirical frameworks, while introducing new insights related to financial dollarization. In particular, they allow the analysis to assess whether the conventional determinants of reserve holdings remain valid once deposit dollarization is incorporated as a conditioning factor.

Three papers are replicated to the extent permitted by data availability, variable definitions, and sample coverage. Each model contributes to evaluating the effects of determinants associated with different underlying motivations for international reserve holdings. The first model primarily assesses the relevance of mercantilist factors together with a precautionary variable capturing the crisis effect. In the second model, we focus on the importance of financial variables, since the traditional specification proposed by the authors can be approximated by that proposed by Aizenman and Lee (2007). Obstfeld et al. (2010) are especially relevant for

the inclusion of M2-to-GDP and financial openness, since they interpret reserve holdings as a response to financial stability risks and to the possibility that domestic financial liabilities may be converted into foreign currency. Finally, the Cheung and Ito (2009) model jointly incorporates trade-related, precautionary, and financial determinants, thereby providing a more comprehensive assessment of the factors driving international reserve holdings. The variable definitions implemented on the following models are in Annex 1.

The three specifications are as follows:

I. Aizenman and Lee (2007)

$$\left(\frac{\text{reserves}}{\text{GDP}}\right)_{i,t} = \alpha_i + \beta_1 \log_pop_{i,t} + \beta_2 \log_imports_gdp_{i,t} + \beta_3 volatility_{i,t} + \beta_4 proM_Rexp_{i,t-2} + \beta_5 all_crisis_{i,t} + \beta_6 (proM_Rexp_{i,t-2} \times all_crisis_{i,t}) + u_{i,t}$$

II. Obstfeld et al. (2010)

Financial stability with trade model

$$\ln\left(\frac{\text{reserves}}{\text{GDP}}\right)_{i,t} = \alpha_i + \beta_1 \log_m2_gdp_{i,t} + \beta_2 kaopen_{i,t} + \beta_3 pegtype_{i,t} + \beta_4 \log_trade_{i,t} + u_{i,t}$$

III. Cheung and Ito (2009)

$$\begin{aligned} \left(\frac{\text{reserves}}{\text{GDP}}\right)_{i,t} = & \beta_0 + \beta_1 imports_gdp_{i,t} + \beta_2 volatility_{i,t} + \beta_3 all_crisis_{i,t} + \beta_4 LAC_{i,t} + \beta_5 pegtype_{i,t} \\ & + \beta_6 net_liab_gdp_{i,t} + \beta_7 creditor_{i,t} + \beta_8 (net_liab_gdp_{i,t} \times creditor_{i,t}) \\ & + \beta_9 growth_net_liab_{i,t} + \beta_{10} M2_gdp_{i,t} + \beta_{11} pel_gdp_{i,t} + \beta_{12} Rule_of_Law_{i,t} + u_{i,t} \end{aligned}$$

All specifications proposed by the authors address different motivations for the accumulation of international reserves, providing a more comprehensive analysis of the possible determinants that may have a significant effect on the study conducted on this paper.

Building on this literature, deposit dollarization is used as the main conditioning variable in this paper to assess how financial dollarization shapes the determinants of international reserve holdings across alternative specifications. This choice is consistent with the literature on reserve adequacy in financially dollarized economies. Gonçalves (2007), Ozyildirim and Yaman (2005), Calvo et al. (2012), and Andreasen and Nuguer (2025) all examine dollarization-related vulnerabilities in connection with international reserves, with particular attention to foreign-currency deposits as a source of liquidity risk. This approach differs from using credit

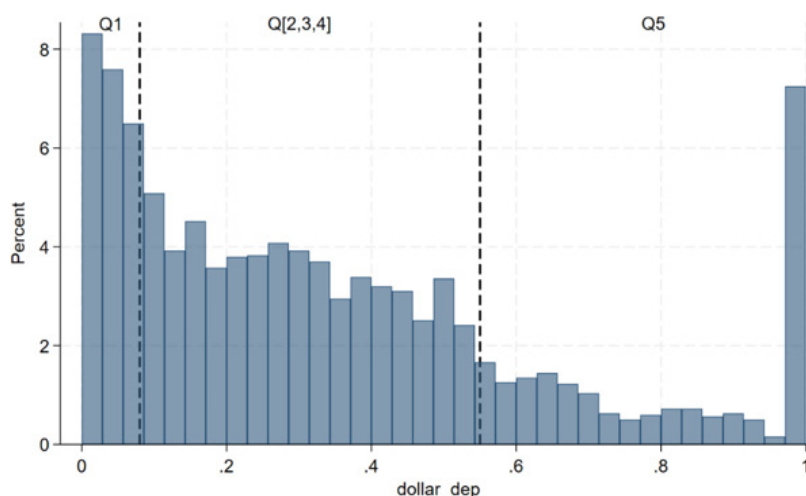
dollarization, which captures a distinct balance-sheet channel related to borrowers' currency mismatches and repayment capacity. By contrast, deposit dollarization is more directly linked to the potential need for foreign-currency liquidity in the banking system, especially under capital-flow reversals, deposit withdrawals, or confidence shocks.

Our interpretation is that deposit dollarization conditions the domestic-liability convertibility channel identified by Obstfeld et al. (2010). In more dollarized financial systems, shifts in residents' portfolios and withdrawals of foreign-currency deposits can generate greater demand for foreign-currency liquidity. We therefore expect financial depth, banking-sector liquidity, and short-term external liabilities to display stronger associations with reserve holdings in high-dollarization environments.

3.2.2. Quintiles and Random Forest model

The quintile specification examines in greater detail how the degree of financial dollarization affects the determinants of international reserve holdings. Instead of estimating a single average effect for the full sample, the analysis separates economies into quintiles according to their degree of deposit dollarization (see Figure 1). Quintile 1 (Q1) covers the lowest levels of deposit dollarization, ranging from 0% to 8%. For this paper, Quintiles 2, 3, and 4 (Q[2,3,4]) were grouped, as they account for the largest proportion of countries with moderate levels of dollarization, between 8% and 55%. In contrast, Quintile 5 (Q5) represents high degrees of dollarization, ranging from 55% to 100%. These specifications allow the model to capture whether the relationship between reserve holdings and its macroeconomic, financial, institutional, and regulatory determinants varies across low, medium, and high-dollarization economies.

Figure 1. Dollarization distribution and quintiles



In addition, we implemented a RF model using a highlighted set of variables commonly identified in the international reserve's literature. This type of model is characterized by offering nonlinear pattern detection in the data and assessing the predictive importance of features. Thus, the model is applied for the full sample and across the quintile-based subsamples to identify the changes in the predictive relevance of the determinants. This approach provides a supervised learning perspective on the role of dollarization in the accumulation of international reserves, while also accounting for potentially nonlinear relationships among the underlying determinants. To this end, the model is estimated using the default hyperparameter settings provided by `sklearn.ensemble` library in Python, as presented in Annex 3.

Based on the Random Forest results, we estimated two country fixed-effects regressions. The first specification includes the variables with the highest predictive importance identified by the machine learning model. The second specification comprises a subset of the most relevant RF variables that have also been consistently highlighted in the international reserves literature, including population, M2, short-term debt, imports, regulatory quality, and capital account openness (KAOPEN). In addition, we include the exchange rate peg determinant identified as an important determinant of international reserve holdings in the literature. These two regressions are robustness checks, demonstrating that the heterogeneous effects of the degree of deposit dollarization on the level of international reserves remain statistically significant and economically meaningful under a linear econometric framework.

4. Results

This section presents empirical evidence on the relationship between international reserve holdings and financial dollarization. The first part reports the results of the comparison with the literature and incorporates interactions with deposit dollarization to highlight the influence of this phenomenon on seminal models. The second part introduces the Random Forest model, in which different variables were used, informed by the literature review on international reserve holdings. The results highlight the changing predictive importance of the implemented variables across the analyzed quintiles. The third part presents two fixed-effects specifications, built around the main variables identified in the RF model and literature, incorporating traditional macroeconomic, financial, and regulatory variables to assess the relevance of dollarization. All results are presented for both the full sample and the quintile-based subsamples.

4.1. Comparison with Seminal Models

Table 2 reports the results of selected regressions from a group of seminal papers, including Aizenman and Lee (2007), Obstfeld et al. (2010) and Cheung and Ito (2009), interacting with the dollarization of deposits. For each specification, the variables used in the original study were preserved⁵.

Table 2. Interactions between international reserves determinants and dollarization

<i>Variables</i>	<i>(1) Aizenman and Lee (2007)</i>	<i>(2) Obstfeld et al. (2010)</i>	<i>(3) Cheung and Ito (2009)</i>
<i>log_pop x dollar_dep</i>	-2.745** (1.134)		
<i>log_imports_gdp x dollar_dep</i>	9.399* (5.474)		
<i>volatility x dollar_dep</i>	0.058 (0.248)		-11.73*** (3.82)
<i>L2.proM_Rexp x dollar_dep</i>	-7.933 (11.57)		
<i>all_crisis x dollar_dep</i>	-0.451 (1.682)		-9.191*** (1.621)
<i>L2.proM_Rexp x all_crisis</i>	1.675 (5.013)		
<i>log_real_gdp_pc x dollar_dep</i>			
<i>log_m2_gdp x dollar_dep</i>		0.413*** (0.089)	
<i>kaopen x dollar_dep</i>		0.162*** (0.0277)	
<i>pegtype x dollar_dep</i>		0.198** (0.0859)	14.16*** (2.584)
<i>log_trade x dollar_dep</i>		-0.413*** (0.0692)	
<i>imports_gdp x dollar_dep</i>			0.158*** (0.033)

⁵ When the determinant or its structure was not feasible to estimate, proxy variables were employed to approximate the effects. In the following regressions, the original variables were adapted to the new data environment of this paper, such as period coverage and frequency of observations.

<i>LAC x dollar_dep</i>			-13.55*** (2.193)
<i>net_liab_gdp x dollar_dep</i>			-0.000442*** (0.000131)
<i>growth_net_liab x dollar_dep</i>			-0.316 (0.359)
<i>M2_gdp x dollar_dep</i>			-0.00112*** (0.000399)
<i>pef_gdp x dollar_dep</i>			561,428*** (77,601)
<i>Rule_of_Law x dollar_dep</i>			8.951*** (1.473)
<i>Constant</i>	23.00*** (2.174)	2.780*** (0.036)	19.64*** (0.608)
<i>Observations</i>	1,584	1,556	1,336
<i>R-squared</i>	0.029	0.07	0.152
<i>Number of id</i>	102		

Note: The dependent variable in columns (1) and (3) is total international reserves (including gold) as a percentage of GDP. In column (2) the dependent variable is the natural logarithm of total international reserves (including gold) as a percentage of GDP. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The results suggest that deposit dollarization changes how traditional determinants are associated with international reserve holdings. The Aizenman and Lee (2007) specification shows significant interactions between dollarization and trade-related variables, suggesting that mercantilist motives may vary with the degree of dollarization. However, the Obstfeld et al. (2010) and Cheung and Ito (2009) specifications provide stronger evidence for precautionary motives, as financial variables become more relevant once dollarization is incorporated.

Overall, the findings indicate substantial heterogeneity: in more dollarized economies, trade openness may increase reserve needs by raising exposure to external shocks, while financial variables such as M2-to-GDP, net liabilities, exchange rate pegs, portfolio equity liabilities, and institutional quality suggest that reserve holdings are increasingly linked to financial stability, foreign-currency liquidity needs, and self-insurance capacity. These results justify estimating the seminal models across dollarization quintiles to assess whether reserve determinants differ between low, medium, and highly dollarized economies. These results are shown in tables 3 to 5.

Table 3. Aizenman and Lee (2007)

Variables	(1) Full Sample	(2) Q1	(3) Q[2,3,4]	(4) Q5
<i>log_pop</i>	12.38** (4.938)	4.137 (12.65)	4.655 (4.788)	33.88* (17.79)
<i>log_imports_gdp</i>	8.091*** (2.477)	9.201 (8.618)	6.596*** (2.220)	10.83 (7.002)
<i>volatility</i>	-0.442 (0.785)	-1.532 (3.102)	-5.094*** (1.281)	0.466 (0.291)
<i>proM_Rexp = L2,</i>	10.90* (5.825)	21.07* (11.00)	20.70*** (7.485)	-4.970 (8.544)
<i>all_crisis</i>	0.117 (0.985)	-1.263 (1.920)	0.377 (1.203)	1.088 (2.110)
<i>L2.proM_Rexp x all_crisis</i>	-12.36* (6.422)	-21.08 (38.48)	-22.85*** (7.755)	-18.73** (8.475)
<i>Constant</i>	-208.3** (83.77)	-74.12 (211.2)	-81.27 (82.18)	-543.9* (294.9)
<i>Observations</i>	1,584	231	1,002	351
<i>R-squared</i>	0.077	0.104	0.084	0.130
<i>Number of id</i>	102	27	81	31

Note: The dependent variable is the total international reserves (including gold) as a percentage of GDP. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The Aizenman and Lee (2007) specification shows that reserve determinants vary across dollarization quintiles. In the middle quintiles, mercantilist variables and exchange rate volatility are significant, suggesting that moderately dollarized economies accumulate reserves to manage exchange rate risks and preserve competitiveness. In low-dollarization economies, reserves are mainly associated with real exports, while in highly dollarized economies, population and crisis-related export shocks point to stronger liquidity and financial stability needs.

Table 4. Obstfeld et al. (2010) – Financial model

<i>Variables</i>	<i>(1) Full Sample</i>	<i>(2) Q1</i>	<i>(3) Q[2,3,4]</i>	<i>(4) Q5</i>
<i>log_m2_gdp</i>	0.303*** (0.0486)	0.595*** (0.145)	0.186*** (0.0428)	0.819*** (0.0520)
<i>kaopen</i>	0.0733*** (0.0107)	-0.0371 (0.0445)	0.0852*** (0.0128)	0.0510** (0.0232)
<i>pegtype</i>	0.163*** (0.0351)	0.349*** (0.0899)	0.146*** (0.0385)	-0.357*** (0.0586)
<i>log_trade</i>	0.557*** (0.0495)	0.440*** (0.119)	0.659*** (0.0572)	-0.0109 (0.105)
<i>Constant</i>	-0.890*** (0.223)	-1.646*** (0.450)	-0.883*** (0.276)	-0.0611 (0.503)
<i>Observations</i>	1,556	245	1,052	259
<i>R-squared</i>	0.301	0.363	0.320	0.581

Note: The dependent variable is the natural logarithm of total international reserves (including gold) as a percentage of GDP. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

In the financial specification of Obstfeld et al. (2010) shows that reserve accumulation is increasingly driven by financial motives as dollarization rises. M2-to-GDP remains positive across all quintiles, capital account openness becomes significant from Q2 to Q5, and trade openness matters mainly at low and medium dollarization levels. The coefficient on exchange rate pegs turns negative in Q5. This result should be interpreted cautiously because the high-dollarization group includes heterogeneous monetary arrangements, including fully dollarized economies.

Table 5. Cheung and Ito (2009)

Variables	(1) Full Sample	(2) Q1	(3) Q[2,3,4]	(4) Q5
<i>imports_gdp</i>	0.168*** (0.0191)	0.393*** (0.0707)	0.167*** (0.0201)	-0.0116 (0.0420)
<i>volatility_r</i>	-5.898*** (1.467)	-9.479* (5.102)	-4.314*** (1.463)	-6.306** (2.467)
<i>all_crisis</i>	-5.821*** (0.712)	-11.38*** (3.234)	-4.380*** (0.734)	-0.826 (1.210)
<i>LAC</i>	-4.581*** (0.709)	-8.545*** (2.681)	-3.228*** (0.715)	-0.656 (1.475)
<i>pegtype</i>	4.395*** (0.789)	-0.439 (2.065)	2.651*** (0.746)	-7.670*** (1.217)
<i>net_liab_gdp</i>	-0.000169** (6.59e-05)	-0.000328 (0.000353)	-0.000115** (5.44e-05)	-0.00141 (0.00102)
<i>creditor</i>	9.324*** (1.706)	-0.301 (3.947)	11.85*** (2.033)	-0.999 (5.716)
<i>net_liab_gdp x creditor</i>	-6.57e-06 (0.000101)	-0.0147** (0.00663)	-4.90e-05 (9.73e-05)	-0.216 (0.138)
<i>growth_net_liab</i>	-0.0259 (0.246)	0.772 (0.752)	-0.101 (0.221)	0.263 (0.681)
<i>M2_gdp</i>	-1.95e-05 (0.000109)	0.0393 (0.0370)	-0.000217** (9.41e-05)	0.408*** (0.0194)
<i>pel_gdp</i>	12,890 (15,547)	-301,424*** (110,127)	9,378 (16,785)	1.102e+06*** (306,836)
<i>Rule_of_Law</i>	2.763*** (0.633)	-0.460 (1.934)	2.219*** (0.640)	-4.180*** (1.131)
<i>Constant</i>	14.32*** (1.023)	9.777** (3.785)	12.78*** (1.099)	3.166 (2.672)
<i>Observations</i>	1,336	208	894	234
<i>R-squared</i>	0.260	0.419	0.366	0.878

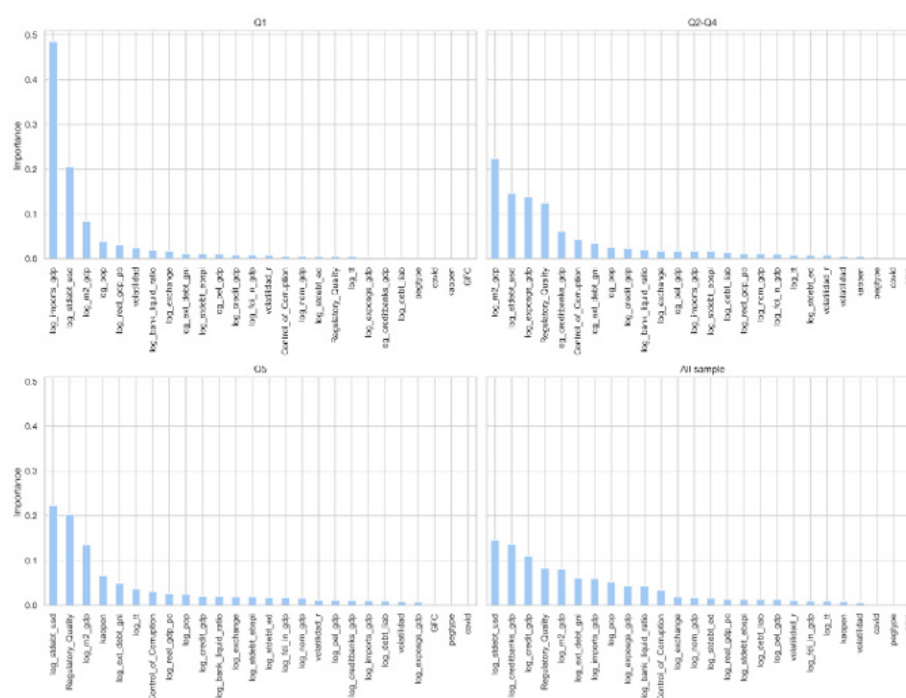
Note: The dependent variable is the total international reserves (including gold) as a percentage of GDP. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The Cheung and Ito (2009) specification, quintile results show that reserve determinants change with deposit dollarization. In low and middle quintiles, trade openness, exchange rate pegs, creditor status, and rule of law remain relevant in the low and intermediate-dollarization samples. In Q5, however, imports lost significance, while M2-to-GDP and portfolio equity liabilities became strongly positive. This pattern is consistent with a stronger financial channel.

4.2. Random Forest

Figure 2 presents the predictive importance scores and ranking obtained from the Random Forest model, considering variables associated with the different motivations underlying international reserve holdings for the different quintiles.

Figure 2. Variable predictive importances – quintiles and all sample



As shown, the predictive importance of several variables varies across the different quintiles. Thus, the machine learning approach provides an initial indication of which determinants are likely to be most relevant under low, intermediate, and high levels of deposit dollarization. To corroborate these findings within an econometric framework, Table 6 presents the results of the country fixed-effects specification estimated using the variables identified as the most important by the Random Forest model.

Table 6. Fixed-effects model using RF variables

<i>Variables</i>	(1) <i>Full Sample without interaction</i>	(2) <i>Full Sample with dollarization interaction</i>	(3) <i>Q1</i>	(4) <i>Q[2,3,4]</i>	(5) <i>Q5</i>
<i>log_pop</i>	0.534*** (0.142)	-0.240*** (0.0457)	-0.527 (0.448)	-0.0799 (0.143)	0.873 (0.630)
<i>log_m2_gdp</i>	0.0869*** (0.0243)	0.210*** (0.0668)	0.827*** (0.185)	0.0157 (0.0208)	0.274** (0.125)
<i>log_bank_liquid_ratio</i>	0.244*** (0.0304)	0.452*** (0.0897)	0.303*** (0.0487)	0.144*** (0.0402)	0.240*** (0.0872)
<i>log_stdebt_usd</i>	0.0375*** (0.00791)	0.0805*** (0.0160)	0.0106 (0.00950)	0.0285* (0.0153)	0.0415** (0.0169)
<i>log_imports_gdp</i>	0.235*** (0.0715)	0.00143 (0.161)	-0.142 (0.167)	0.275*** (0.0787)	0.244* (0.140)
<i>Regulatory_Quality</i>	0.143*** (0.0542)	0.338*** (0.108)	-0.401*** (0.131)	0.277*** (0.0701)	0.205* (0.105)
<i>Volatility</i>	-0.654*** (0.185)	-1.152*** (0.431)	-1.212** (0.499)	-0.381* (0.211)	-0.571** (0.245)
<i>Kaopen</i>	0.0904*** (0.0209)	0.136*** (0.0422)	0.107*** (0.0260)	0.0727** (0.0283)	0.0507 (0.0432)
<i>Constant</i>	-8.741*** (2.273)	2.666*** (0.0781)	7.235 (6.621)	1.916 (2.253)	-14.92 (9.665)
<i>Observations</i>	1,129	1,129	176	742	206
<i>R-squared</i>	0.813	0.798	0.914	0.831	0.852

Note: The dependent variable is the natural logarithm of total international reserves (including gold) as a percentage of GDP. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The RF exercise indicates that reserve holdings are shaped by financial, external, institutional, and macroeconomic factors whose relevance varies with deposit dollarization. The model is used as a flexible variable-selection device capable of capturing nonlinearities and interactions that may be overlooked in conventional linear specifications.

Column 2 shows that deposit dollarization significantly modifies the relationship between reserves and most variables selected by the RF in contrast with column 1. The strongest positive interaction is observed for the bank liquidity ratio, indicating that banking-sector liquidity becomes more closely associated with reserve holdings as dollarization rises. This is consistent with the view that reserves provide foreign-currency liquidity

against deposit withdrawals, capital flight, and disruptions in banks' access to external funding in financially open economies (Obstfeld et al., 2010; Ozyildirim and Yaman, 2005).

The positive interactions with M2-to-GDP and short-term external debt reinforce this interpretation. A larger financial system generates greater potential liquidity needs when domestic liabilities can be converted into foreign currency, while short-term debt increases rollover and refinancing risks (Obstfeld et al., 2010; Beck and Rahbari, 2011; Bussière et al., 2015). Capital account openness also becomes more relevant as dollarization rises, suggesting that reserves provide insurance against volatile capital flows. By contrast, the insignificant interaction with imports indicates that dollarization mainly amplifies financial and precautionary channels rather than the conventional trade-related motive.

The joint prominence of M2-to-GDP, banking-sector liquidity, and short-term external debt is consistent with a domestic portfolio-shift and foreign-currency liquidity channel. In dollarized financial systems, a loss of confidence may induce residents to convert local-currency assets into foreign currency, withdraw foreign-currency deposits, or transfer funds abroad. These operations can simultaneously increase foreign-exchange demand and the banking system's need for foreign-currency liquidity, thereby strengthening the precautionary motive for holding reserves.

The negative interaction with exchange rate volatility may be consistent with the active use of reserves to smooth currency fluctuations, particularly where depreciation produces stronger balance-sheet effects. However, this coefficient should be interpreted cautiously because reserve intervention and exchange rate volatility are jointly determined. The negative interaction with population similarly suggests that financial exposures become more relevant than economic size as dollarization increases.

The consistency between the RF-selected variables and those that remain significant in the regression analysis identifies financial depth, banking liquidity, short-term liabilities, financial openness, institutional quality, and exchange rate conditions as central predictors of reserve holdings. Nevertheless, these findings indicate predictive relevance rather than causal effects.

Columns 3-5 reveal substantial heterogeneity across the dollarization distribution. The results suggest a gradual shift from a broad combination of financial, institutional, and external determinants in low and moderately dollarized economies toward a more concentrated financial-stability motive in highly dollarized economies.

In the lowest quintile, M2-to-GDP, bank liquidity, and capital account openness are positively associated with reserves, indicating that precautionary reserve demand is not exclusive to highly dollarized economies. Regu-

latory quality enters negatively, suggesting that stronger institutions may partially substitute for reserves by reducing uncertainty and perceived vulnerability. Exchange rate volatility is also negative, potentially reflecting the use of reserves to smooth currency movements.

In the middle quintiles, bank liquidity, short-term debt, imports, and capital account openness are positively associated with reserves. This combination points to the coexistence of trade-related and financial motives: reserves insure against both real external shocks and disruptions in external financing. The positive coefficient on regulatory quality may indicate that stronger institutions complement reserve holdings by supporting more systematic prudential policies.

The highest quintile provides the clearest evidence of a financial-stability channel. Bank liquidity, M2-to-GDP, and short-term external debt remain positive and significant, while capital account openness loses significance and imports are only weakly significant. Reserve holdings therefore appear to depend increasingly on domestic and external balance-sheet structures. In highly dollarized economies, foreign-currency deposits, short-term liabilities, and limited lender-of-last-resort capacity in foreign currency increase the value of reserves as a systemic liquidity buffer (Ozyildirim and Yaman, 2005; Gonçalves, 2007; Santilli, 2024).

Overall, the RF results show that the determinants of reserve holdings vary with the currency composition of the financial system. As dollarization rises, financial depth, banking liquidity, and short-term liabilities become increasingly central, supporting the hypothesis that financial dollarization transforms reserves from a general external buffer into an instrument of financial stability and balance-sheet insurance.

On the other hand, Table 7 presents the second robustness check. In this specification, we select a subset of the variables identified as important by the Random Forest model that are also widely recognized in existing literature. Additionally, we include the exchange rate peg variable, as it is considered a relevant determinant within the precautionary motives for reserve holdings. Column 2 shows the interactions between deposit dollarization and the main variables identified in the literature and the machine learning model.

Table 7. Fixed-effects model using relevant RF variables present in the literature

Variables	(1) Full Sample without interaction	(2) Full Sample with dollarization interaction	(3) Q1	(4) Q[2,3,4]	(5) Q5
<i>log_pop</i>	0.435*** (0.136)	-0.415*** (0.0526)	-2.166*** (0.636)	-0.0264 (0.131)	1.102** (0.514)
<i>log_imports_gdp</i>	0.453*** (0.0776)	0.360** (0.166)	0.0171 (0.212)	0.451*** (0.0735)	0.265** (0.129)
<i>log_m2_gdp</i>	0.105*** (0.0297)	0.262*** (0.0795)	1.342*** (0.298)	0.0264 (0.0228)	0.405*** (0.120)
<i>kaopen</i>	0.0510** (0.0233)	0.142*** (0.0507)	0.154*** (0.0421)	0.0446 (0.0281)	0.00574 (0.0488)
<i>log_stdebt_usd</i>	0.0530*** (0.0124)	0.158*** (0.0370)	0.0202 (0.0162)	0.0395** (0.0184)	0.0597 (0.0393)
<i>pegtype</i>	0.151*** (0.0414)	0.186* (0.101)	0.168 (0.160)	0.129*** (0.0392)	-0.130 (0.0934)
<i>Regulatory_Quality</i>	0.156** (0.0640)	0.412*** (0.153)	-0.912*** (0.196)	0.376*** (0.0796)	0.222* (0.117)
<i>Constant</i>	-7.841*** (2.105)	2.868*** (0.0773)	30.76*** (8.892)	0.451 (2.000)	-18.44** (7.527)
<i>Observations</i>	1,233	1,233	185	839	202
<i>R-squared</i>	0.788	0.782	0.881	0.810	0.889

Note: The dependent variable is the natural logarithm of total international reserves (including gold) as a percentage of GDP. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The second estimation complements the RF results by assessing whether the variables identified through the nonlinear selection process retain explanatory relevance in a conventional econometric framework. The interaction specification shows that financial dollarization conditions the relationship between international reserves and several determinants. Positive interactions with imports, M2-to-GDP, capital account openness, short-term external debt, exchange rate pegs, and regulatory quality indicate that these variables become more strongly associated with reserve holdings as dollarization rises. This pattern is consistent with the RF evidence that dollarization amplifies precautionary and financial-stability motives by increasing foreign-currency liquidity needs, rollover exposure, and balance-sheet risks. The results suggest that dollarization modifies the channels through which macroeconomic, financial, and institutional conditions affect reserve demand.

The quintile estimations are heterogeneous. In Q1, reserve holdings are associated with M2-to-GDP, capital account openness, and regulatory quality, while imports, short-term external debt, and exchange rate pegs are not statistically significant. This suggests that, at low levels of deposit dollarization, reserve demand is more related to financial depth, capital-flow exposure, and institutional conditions than to trade or external-liquidity motives. In the middle quintiles, trade, financial, external, and institutional variables become relevant, indicating a more diversified structure of reserve demand. These economies appear to accumulate reserves in response to trade exposure, external financing needs, exchange rate arrangements, and prudential concerns. In Q5, financial variables gain prominence, particularly M2-to-GDP, indicating that reserve holdings in highly dollarized economies are linked to financial depth and the conversion of domestic liabilities into foreign currency.

Overall, the panel evidence reinforces rather than drives the main findings of the RF analysis. Both approaches indicate that the determinants of reserve holdings vary with deposit dollarization and that financial-system variables become increasingly important as dollarization rises. This supports the interpretation that reserves shift from a general external buffer toward a more specific instrument of foreign-currency liquidity and balance-sheet insurance in highly dollarized economies. The results are consistent with the precautionary framework developed by Obstfeld et al. (2010), Bussière et al. (2015), and Calvo et al. (2012), as well as with Gonçalves (2007) and Ozyildirim and Yaman (2005), who emphasize the vulnerabilities created by financial dollarization.

5. Conclusions

This paper examines whether deposit dollarization conditions the relationship between international reserve holdings and their conventional determinants. The main finding is that deposit dollarization is associated with reserve holdings and conditions the relevance of their traditional determinants. Across the literature-based specifications, panel estimations, quintile analysis, and Random Forest exercise, the results consistently indicate that the degree of dollarization influences the relationships between macroeconomic, financial, institutional, and external variables and international reserves. Reserve holdings should therefore not be analyzed as a homogeneous process across emerging and developing economies, particularly when financial dollarization is a persistent feature of the domestic financial system.

The results are consistent with a precautionary interpretation of reserve holdings. Although trade-related variables remain relevant in several specifications, financial variables become comparatively more prominent in highly dollarized environments. In particular, indicators of financial system depth, short-term external debt, banking-sector liquidity, and capital account openness are strongly associated with reserve holdings. This pa-

tern is consistent with Obstfeld et al. (2010), who emphasize the role of reserves as a buffer against financial instability, and with Bussière et al. (2015), who highlight the insurance role during periods of financial distress. The findings also align with Calvo, et al. (2012) and Céspedes and Chang (2020), who show that reserves can mitigate balance-sheet effects in economies exposed to sudden stops. Finally, the heterogeneity observed across quintiles is also consistent with Cheung and Ito (2009) and Delatte and Fouquau (2011), who find that reserve determinants vary across countries and may display nonlinear patterns.

One interpretation of these findings is that financial dollarization strengthens the domestic portfolio-shift channel of reserve demand. When confidence deteriorates or depreciation expectations increase, residents may reallocate their portfolios from local-currency deposits, cash, or external assets. At the same time, withdrawals or external transfers of existing foreign-currency deposits can create additional liquidity pressures. Reserves therefore provide insurance not only against external debt repayments and sudden stops, but also against residents' conversion of domestic assets into foreign currency and systemic withdrawals of foreign-currency deposits. This mechanism offers an economic explanation for why financial depth and banking-sector liquidity become relatively more relevant correlates of reserves in highly dollarized environments. Because the analysis does not directly observe portfolio conversions or deposit withdrawals, however, the results should be interpreted as consistent with this channel rather than as a direct test of it.

The persistence of dollarization documented by Reinhart et al. (2003), Ize and Levy-Yeyati (2003), Levy-Yeyati (2006), and Castillo et al. (2024) suggest that reserve-adequacy frameworks should treat financial dollarization as a structural feature of the macro-financial environment rather than as a temporary deviation. Even after inflation declines and macroeconomic conditions improve, foreign currency may continue to be used as a hedge against depreciation risk, policy uncertainty, and credibility constraints. This dollarization hysteresis implies that financial systems may remain exposed to foreign-currency liquidity pressures even during periods of apparent macroeconomic stability.

This persistence has direct implications for reserve holdings. In highly dollarized economies, foreign-currency deposits can become a source of systemic vulnerability if confidence shocks, exchange-rate pressures, or capital-flow reversals trigger a surge in demand for foreign-currency liquidity. Unlike domestic-currency liquidity, foreign currency cannot be created by central bank. International reserves are therefore not only a buffer against external payment needs, but also part of the policy toolkit used to contain domestic financial instability arising from currency mismatches, portfolio shifts, and potential deposit withdrawals. In this sense, dollarization may change the nature of precautionary reserve demand by increasing the relevance of the central bank's foreign-currency liquidity-insurance role.

From a policy perspective, the results suggest that reserve adequacy assessments in financially dollarized economies could benefit from explicitly incorporating the degree of deposit dollarization and the currency composition of domestic financial liabilities. Traditional benchmarks based on imports, short-term external debt, or broad money remain informative, but may be insufficient when foreign-currency deposits create additional liquidity risks. Therefore, reserve management frameworks should consider the interaction between dollarization, financial depth, external exposure, banking sector liquidity, and institutional quality. Future research could distinguish between deposit and credit dollarization, incorporate bank-level balance-sheet data, examine nonlinear threshold effects more formally, and assess whether reserves have different macro-financial effects across dollarization regimes. These extensions would help clarify not only why dollarized economies hold reserves, but also how effective those reserves are in mitigating financial instability.

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Annex

Annex 1. Data Sources and Definitions

<i>Variable</i>	<i>Abbreviation</i>	<i>Source</i>	<i>Short definition</i>
Population	log_pop	WB WDI	Total population
M2 as a share of GDP (%)	log_m2_gdp	WB WDI	Broad money as GDP share
Bank liquid reserves to bank assets ratio	log_bank_liquid_ratio	WB WDI	Bank liquidity as asset share
Short-term debt in USD	log_stdebt_usd	WB WDI	Short-term external debt burden
Imports as a share of GDP (%)	log_imports_gdp	WB WDI	Import share of GDP
Regulatory Quality	Regulatory_Quality	WB WDI	Regulatory quality governance index
Exchange rate LCU per USD	log_exchange	WB WDI	Official exchange rate level
Exchange rate peg (binary)	pegtype	AREAER IMF	Fixed exchange rate regime = 1
Exchange rate volatility	volatility	WB WDI	Volatility of official exchange rate
Deposit dollarization (%)	dollar_dep	Levy-Yeyati (2021), updated	Domestic deposit dollarization ratio
Total international reserves (including gold) as a share of GDP (%)	log_r	WB WDI	Official reserve assets including gold
Crisis (binary)	all_crisis	Nguyen et al. (2022)	Systemic financial crisis dummy
Real GDP per capita in USD	log_real_gdp_pc	WB WDI	Real GDP per capita (2015)
Chinn-Ito Index	kaopen	Chinn and Ito (2006)	Capital account openness index
Total trade as a share of GDP (%)	log_trade	WB WDI	Trade openness (sum of exports and imports) as GDP share
Net liabilities as share of GDP (%)	net_liab_gdp	Lane and Milesi-Ferretti (2018)	Liabilities minus assets as GDP share
Portfolio equity liabilities as a share GDP (%)	pel_gdp	Lane and Milesi-Ferretti (2018)	Portfolio equity liabilities stock as GDP share
Rule of Law	Rule_of_Law	WB WDI	Rule of law index
Latin America (binary)	LAC	Own construction	Latin America country dummy
Creditor (binary)	creditor	Cheung and Ito (2009)	Negative net debt liabilities = 1
Moving average of real exports	proM_Rexp	Aizenman and Lee (2007)	Moving average of real exports considering 3 years

Annex 2. Descriptive Statistics by Quintiles

Q1					
Name of variable	N	Mean	St. Dev.	Min.	Max.
log_pop	385	14.70	2.65	11.11	19.31
log_m2_gdp	370	4.11	0.52	2.24	5.00
log_bank_liquid_ratio	330	2.74	0.83	0.82	4.83
log_stdebt_usd	290	23.23	4.14	6.36	29.55
log_imports_gdp	292	3.71	0.45	2.52	4.61
Regulatory_Quality	358	-0.19	0.68	-2.08	1.67
log_exchange	375	2.60	2.24	-0.96	10.41
pegtype	350	0.67	0.47	0	1
volatility	375	0.06	0.12	0	1.37
dollar_dep	385	0.04	0.02	0	0.08
log_r	367	2.83	0.78	-1.37	4.43
Q2, Q3, Q4					
log_pop	1366	16.03	2.01	10.72	21.07
log_m2_gdp	1285	3.85	0.81	1.97	9.50
log_bank_liquid_ratio	1135	2.94	0.64	0.12	4.81
log_stdebt_usd	1040	25.57	2.52	17.09	32.55
log_imports_gdp	1174	3.68	0.48	2.33	5.25
Regulatory_Quality	1308	-0.12	0.66	-1.73	1.69
log_exchange	1364	3.57	2.70	-1.54	10.16
pegtype	1345	0.45	0.50	0	1
volatility	1361	0.07	0.12	0	2.80
dollar_dep	1366	0.30	0.14	0.08	0.55
log_r	1354	2.72	0.75	-2.26	4.59
Q5					
log_pop	525	14.69	2.07	9.78	18.41
log_m2_gdp	399	3.56	0.70	1.07	5.56
log_bank_liquid_ratio	341	2.88	0.95	-0.71	4.65
log_stdebt_usd	342	24.50	2.33	14.31	30.10
log_imports_gdp	455	3.91	0.43	2.33	4.75
Regulatory_Quality	476	-0.43	0.68	-1.86	1.05
log_exchange	520	2.58	2.84	-2.43	9.55
pegtype	388	0.52	0.50	0	1
volatility	519	0.09	0.44	0	9.37
dollar_dep	525	0.81	0.17	0.55	1
log_r	455	2.69	0.86	-1.03	5.04

Annex 3. Random Forest configuration

<i>Hyperparameter</i>	<i>Value</i>
bootstrap	True
criterion	'squared_error'
max_depth	None
max_features	1
min_samples_leaf	1
min_samples_split	2
n_estimators	100
random_state	42



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