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Abstract

This paper assesses the impact of de-dollarization measures implemented by the Central Reserve Bank of Peru between the years 2013 and 2016. Our results show that, despite an already slight downward trend in credit dollarization indicators before their implementation, the pace of de-dollarization increased after the adoption of the mentioned policy measures, especially after the announcement in the beginning of 2015. In contrast to a generalized impact of measures in 2015 onwards on all market segments, de-dollarization measures in 2013 affected mainly certain segments by firm size such as corporate and small firms. In addition, an heterogeneous impact is identified by loan size, where banks prefered to substitute larger loans from foreign to domestic currency.

Resumen

Este trabajo evalúa el impacto de las medidas que el BCRP implementó entre 2013 y 2016. Nuestros resultados muestran que, a pesar de la existencia de una ligera tendencia a la baja en los indicadores de dolarización del crédito antes de su implementación, el ritmo de desdolarización se aceleró luego de la adopción de las medidas de política anteriormente mencionadas, especialmente luego del anuncio a inicios de 2015. A diferencia del impacto homogeneo de las medidas de 2015 en adelante en todos los segmentos de crédito, las medidas de 2013 afectaron principalmente ciertos segmentos tales como corporativos y empresas pequeñas. Asimismo, se identifica un efecto heterogeneo por tamaño del crédito, donde los bancos prefirieron sustituir los préstamos de mayor tamaño de moneda extranjera a moneda doméstica.

JEL classification: E58, G21, G28
Key words: credit dollarization, macroprudential policies, credit register data

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1 Introduction

One of the main risk exposures of the Peruvian financial system is related to the high degree of financial dollarization. Currency mismatches in the balance sheet of firms between dollar-denominated credit and income flows in domestic currency creates an amplification mechanism on the financial cost when an abrupt sharp depreciation hits the economy. Since the adoption of the inflation targeting regime in 2002, the exposure to this risk decreased, as the ratio of credit dollarization fell from 78 percent in 2001 to 43 percent in 2012. However, this level of financial dollarization is still high compared to other economies in the region.

Therefore, the Central Reserve Bank of Peru (BCRP hereafter) implemented a set of policies to reduce the exposure of the economy to dollarization risks and strengthen the transmission mechanism of monetary policy. Since 2013 BCRP set additional reserve requirements for credit in foreign currency depending on certain thresholds on previous credit stocks by each bank in order to incentivize currency substitution towards intermediation in domestic currency. Part of the mentioned program was the fact that the BCRP gave additional facilities to private banks to get funding in domestic currency, i.e. the currency-Repo operation, where the private bank receives domestic currency (soles) and gives dollars as a collateral[1].

This work assesses and quantifies the impact of these policy measures on the currency composition of credit supplied by the banking sector to private firms, and identifies the existence of heterogeneous impacts by credit segment, economic sector and loan size. In order to do that, we use a large dataset from the credit register central at the bank-firm level with monthly data from December 2010 to December 2017. Using this granular data, we evaluate the impact of the dedollarization policies implemented by BCRP since 2013.

The methodology follows a panel estimation with fixed effects. Alternative estimations with a difference in difference approach could further control whether the results are associated to other events that occured simultaneously to the implementation of the dedollarization program. In order to isolate the effect of dedollarization measures, we include a set of control variables on different dimensions, given the benefit of having a very high degree of granularity in the credit register data. We consider macroeconomic variables, bank level variables and firm level characteristics.

The analysis of macroprudential measures using credit register data has been already used by other countries with this type of granular data. For instance, most of the existing literature focuses on the effect of macroprudential policy measures on credit growth rates. Among the macroprudential policy tools, there are studies on the use of capital requirements (Aguirre and Repetto (2016)), reserve requirements (Barata et al (2016), Cabello et al (2016), Gómez et al (2016)) and dynamic provisions (Cabello et al (2016), Gómez et al (2016), Jiménez et al (2015)). Furthermore, this type of

[1]For more details on the set of policies adopted, see Revista Moneda No 164 and 174.

databases are also used to analyze the transmission mechanism of monetary policy and credit risk exposures in the banking sector (Jiménez et al (2012, 2014)).

In particular, for countries with credit denominated in foreign currency, existing literature considers the differentiated impact by currency of macroprudential policies (Epure et al (2018)) and monetary policy (Ongena et al (2014)). Our work contributes to this strand of the literature by assessing the use of macroprudential measures that are specifically tailored to affect the currency denomination of credit and reduce the degree of credit dollarization.

Thus, some questions posed by this work are:

- What proportion of firms that used to have dollar denominated credit have substitued it for domestic currency credit after the implementation of the dedollarization program? What was the impact of the program modifications in 2015 and 2016?
- Does this effect change across time depending on the monetary policy stance, the policy stance in advanced economies or on the business cycle position?
- Are there differentiated effects by sector, firm size, loan size or by type of financial institution?

Our results show that the policy measures have contributed to reduce the degree of dollarization of credit from the banking system to the private sector. Thus, the set of policy measures have been succesful in reducing the exposure of firms to currency risk and the exposure of banks to credit risk in the event of a sharp and abrupt exchange rate depreciation. Despite a slight downward trend in credit dollarization indicators before 2013, the pace of dedollarization increased especially after the adoption of the policy measures announced in 2015.

In the case of the dedollarization measures of 2013, their impact was mainly concentrated on certain segments such as corporate and small enterprises. With respect to credit size, the prefered strategy by banks was to substitute larger loans from foreign to domestic currency. Smaller loans are mostly in domestic currency and imply a smaller exposure of firms to currency risk as a proportion of their net worth.

Literature review This work contributes to the strand of literature that uses granular credit register data to analyze the impact of monetary and macrofinancial policies. There are several studies on the use of different types of macroprudential policies and their effect on credit growth in a wide set of countries, such as: (i) capital requirements (Aguirre and Repetto (2017)), reserve requirements (Barata et al (2017), Cabello et al (2017), Gomez et al (2017)), and dynamic provisions (Cabello et al (2017), Gomez et al (2017), Jimenez et al (2017)). Even though our work also analyzes the use of a macroprudential tool (additional reserve requirements on the stock of foreign currency credit), we are interested in quantifying the impact on the currency

composition of credit, not on the level of aggregate credit. On the other hand, there is a set of studies that analyze the impact on the monetary policy transmission channel (BIS CCA CGDFS Working Group 2018).

Credit register data has also been used to study the impact of macroprudencial policies on financial risk exposures, such as the impact on credit risk taking by the banking sector (Jimenez et al (2012), Jimenez et al (2014)). Closer to our work, some studies analyze the heterogeneous effects on credit growth by currency of both macroprudential policies (Epure et al (2018), Camors et al (2016)) and monetary policy (Ongena et al (2014)). Thus, our work contributes by evaluating the use of a different type of macroprudential policy (additional reserve requirements on credit) on the currency composition of banking sector credit in Peru.

In particular, other assessments of the impact of macroprudential policies in Peru have focused on aggregate implications, such as a counterfactual analysis of the use reserve requirements in dollars and the dedollarization program (Castillo et al (2016)) and the effect of (deposit) reserve requirement shocks at the bank level (Vega and Chávez (2017)).

Other studies for Peru have also exploited the use of credit register data, but have focused on credit to households rather than credit to firms. Some examples are the stylized facts of household credit dollarization in Peru (Céspedes (2017)) and the impact of credit rating revisions on non-performing loans and access to credit (Garmaise and Natividad (2017)).

This work is organized as follows. Section 2 presents the credit register data and some stylized facts of banking sector credit in Peru. Section 3 presents the empirical strategy. Section 4 shows the results of the econometric analysis. Section 5 concludes.

2 Some stylized facts of banking sector credit in Peru

2.1 Data

Our main data source for credit information at the bank-firm level comes from the credit register central. We complement this using different data sources to obtain control variables. In particular, we consider variables that capture bank characteristics, firm characteristics and macroeconomic variables.

The final database considers monthly data from December 2010 to December 2017. The total number of firm-date observations for credit in each currency is 7 472 052 observations. Table 1 presents a summary of some descriptive statistics from the database. It considers a total of 16 banks and 279,628 firms in our sample. Average characteristics across banks and firms are presented in the Table.

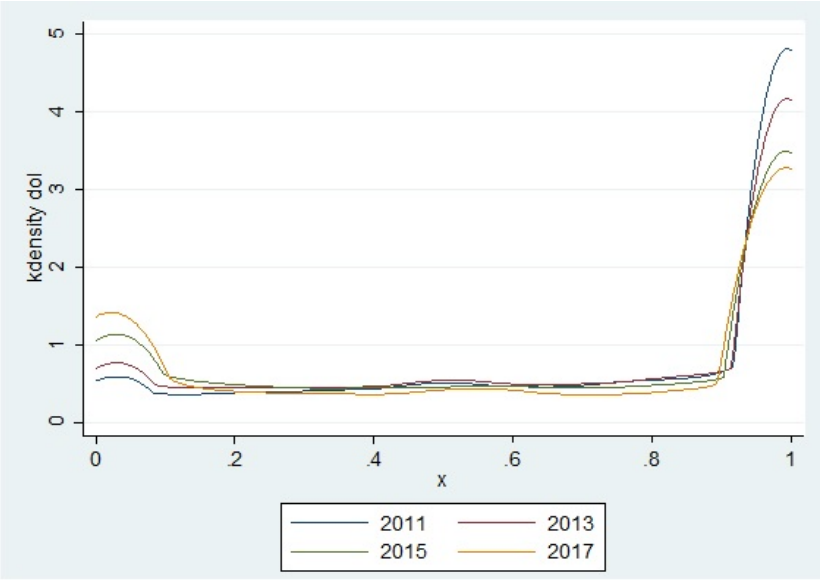
Table 1: Descriptive Statistics

Variable	Definition	Mean	Std Dev	Min	Median	Max
Dependent variables						
Δ Credit dollarization	yoy % var of credit dollarization ratio	-0,001835	0,1417	-1	0	1
Dedollarization Dummy	= 1 if Δ Credit dollarization¡0	0,2774	0,4477	0	0	1
Independent variables						
Dedollarization measure 2013	= 1 if Oct2013	0,0121	0,1095	0	0	1
Dedollarization measure jun2015	= 1 if between Feb2015 and Jun2015	0,0629	0,2428	0	0	1
Dedollarization measure dec2015	= 1 if between Feb2015 and Dec2015	0,1388	0,3458	0	0	1
NPL	non-performing loans as % of total loans	0,1290	0,3274	0	0	1
Macroeconomic variables						
Interest rate differential	i PEN - i USD - Δ exchange rate	0,41376	5,73	-11,21	1,92	10,81
Δ GDP	yoy % var in GDP	4,50	2,30	0,169	4,23	10,31
XR volatility	Std Dev of nominal exchange rate	0,0610	0,0331	0,0124	0,0562	0,1264
ΔXR^e	Expected XR (from survey) vs realized XR	-0,8377	6,12	-11,65	0,5617	12,11
Banking sector variables						
CAR	Capital asset ratio	14,31	0,968	12,03	14,24	32,37
NPL	Non performing loans	2,53	1,13	1,16	2,43	7,26
ROA	Return on assets	2.06	0,62	-1,26	2,15	5,71
LiqMN	Liquid assets in soles as % assets in soles	2,53	5,89	0,01	0,50	44,75
LiqME	Liquide assets in dollars as % of assets in dollars	6,83	20,11	0,46	1,52	9952,23

2.2 Credit dollarization: a review of stylized facts

Using data from the credit register central, we observe some stylized patterns in the distribution of credit dollarization across firms and through time. Figure 1 shows that for a particular date, the cross-sectional distribution of the credit dollarization ratio is bimodal, as most firms either take all of their loans in soles or all in dollars. However, if we observe the evolution of this distribution through time, we find that the proportion of firms with loans only in dollars has decreased sharply.

Figure 1: Cross-sectional distribution of the credit dollarization ratio at the end of each year



The proportion of firms that changed their loans from dollars to soles increased

after the implementation of the dedollarization program, especially for firms in the non-exporting sectors (trade and services). This effect is larger for firms of smaller size. Table 2 shows that firms in the trade and service sectors reduced their credit dollarization coefficient by 9 and 11 percentage points, respectively. Note that firms in these sectors are more exposed to currency mismatches if the take a loan in foreign currency, as their income is mainly denominated in domestic currency and they have less access to financial hedging against exchange rate risk. In contrast, this result differs from credit to the corporate sector, where the largest impact of the dedollarization program is observed on the industrial sector, with a reduction in the credit dollarization ratio by 16 percentage points.

Table 2: Contribution to credit dedollarization by economic sector and segment (in percentage points)

	Aggregate		Corporate		Big firms	
	Dollariz 2017	Contrib 2017-2011	Dollariz 2017	Contrib 2017-2011	Dollariz 2017	Contrib 2017-2011
Industry	47	-9	45	-16	55	-9
Trade	44	-2	47	1	54	-2
Services	39	-5	34	0	46	-3
	Medium size firms		Small firms(Pymes)			
	Dollariz 2017	Contrib 2017-2011	Dollariz 2017	Contrib 2017-2011		
Industry	44	-5	10	-4		
Trade	40	-6	8	-9		
Services	39	-10	12	-11		

A particular feature of the difference in the distribution of outstanding credit stocks in domestic and foreign currency is the size of the loan. Figure 2 shows that, even though most loans are denominated in soles, dollar-denominated loans are larger in size.

Thus, if we consider the aggregate indicator for credit dollarization, the ratio fell from 69,3 to 49,3 percent between 2011 and 2017. However, the proportion of firms with dollar loans fell from 33,8 to 16,8 percent in the same period.

A first look at the data on credit dollarization before and after the implementation of dedollarization policies shows a reduction in the dollarization ratio and heterogeneous effects across segments. Figure 3 shows that dollarization fell sharply on credit to households (especially mortgages and car loans), whereas the reduction in credit dollarization for firms is more moderate (mostly due to loans to medium size firms and to the corporate sector). However, since 2016, the dedollarization process became slower and might have even reverted slightly for the corporate sector.

Figure 2: Outstanding credit stock distribution at the firm level: credit in soles and dollars (in logs), December 2017

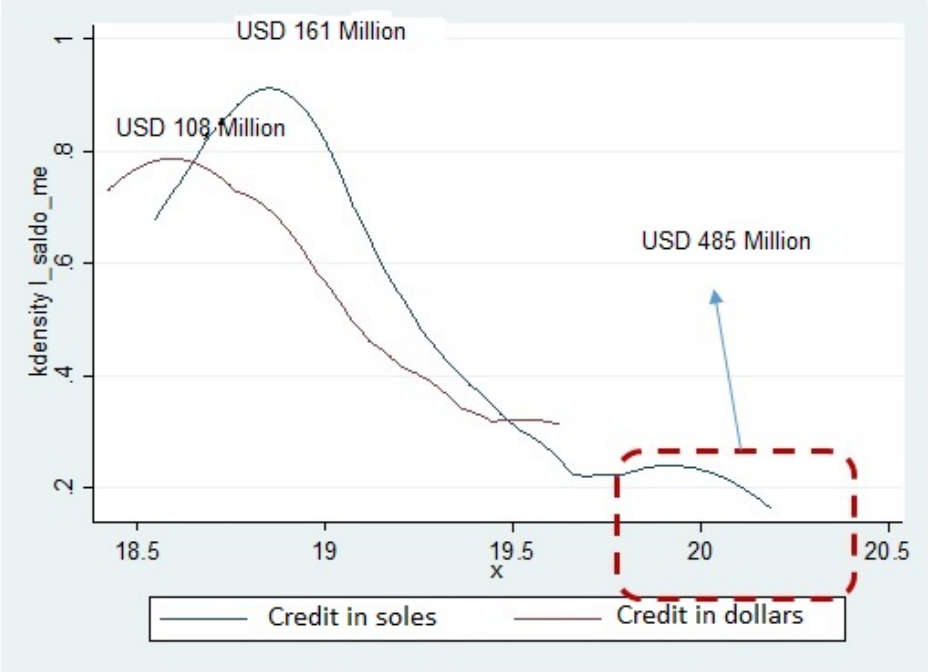
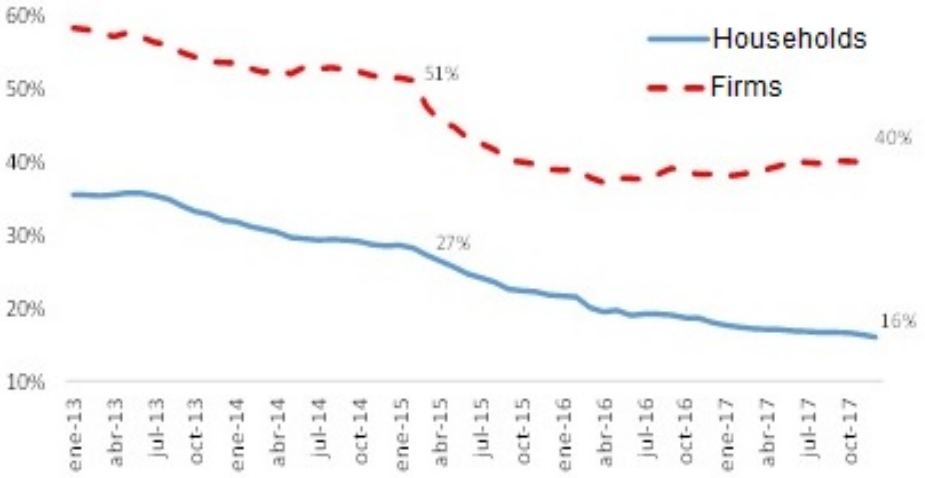


Figure 3: Credit dollarization by segments



2.3 Policy measures to boost credit de-dollarization

Given the relevance of the risks coming from currency mismatches in economies with a high degree of financial dollarization, BCRP implemented a set of policy measures to boost currency substitution of credit towards domestic currency and reduce the

exposition of the banking sector to credit risk coming from fluctuations in the exchange rate. Table 3 presents a summary of the de-dollarization measures from 2013 onwards.

Table 3: De-dollarization measures

Date of implementation	Limit on the credit stock	Exceptions
June 2015	95% of the credit stock (Sep 2013)	Credit for foreign trade transactions Credit with maturity > 4 years and > 10 mill
December 2015	90% of the credit stock (Sep 2013)	Credit for foreign trade Credit with maturity > 4 years and > 10 mill
December 2016	80% of the credit stock (Sep 2013)	Credit for foreign trade Credit with maturity > 4 years and > 10 mill

A first glance at the data shows some evidence pointing towards the effectiveness of the policy measures. The upper section of Figure 4 shows a faster pace in the aggregate dedollarization proccess after the announcement of the first policy measure and until the end date of the second policy measure. Also, if we separate the stock of new credit and the amortization of outstanding credit (lower section) there is evidence of (i) currency substitution for new loans (reduction in new dollar loans and higher growth rates for loans in soles) and (ii) currency substitution in outstanding loans, with pre-payment of some dollar loans together with new loans in soles.

In addition, we use individual credit data at the firm level and compare the dollarization ratio before and after the adoption of these policy measures. Following the methodologies used in the event studies literature, we evaluate if there is a significant change in the trend of credit dollarization, and particularly, if there has been an acceleration towards faster currency substitution towards credit in soles.

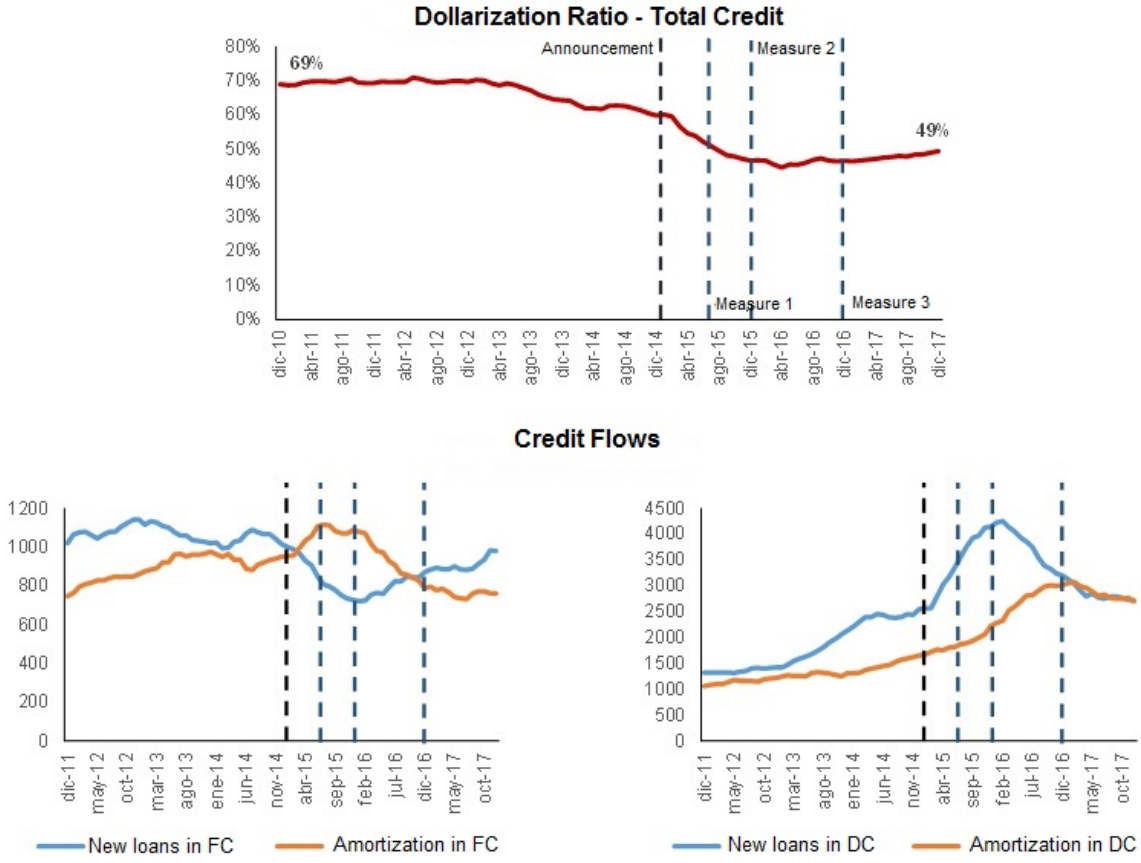
However, before presenting the econometric analysis, there are some caveats on the limitations of our database that we must consider.

- **Foreign trade operations:** Our sample of firms includes those who make foreign trade operations and therefore have direct access to natural hedge to currency risk. Additional reserve requirements to dollar denominated credit consider some exceptions for credit transactions classified as foreign trade, which differs from all credit transactions by firms engaged in exports and imports. In our estimations, we control only for those firms that have exported or imported during the year using information from the National Superintendency of Tax Administration (SUNAT). In this way, we control for those firms with access to natural hedge.

- **Financial hedge against currency risk:** The database includes firms that had financial contracts to hedge against currency risk. 29 percent of firms with dollar loans had access to hedge contracts using exchange rate derivatives. These loans would not be exposed to a currency mismatch, as it would constitute a synthetic operation similar to a credit in domestic currency. In order to control for that, we include an indicator of whether the firm has a FX derivative contract.

- **Exceptions to the additional reserve requirement:** Even though there is no specific detail on those loans that are excluded from the policy measures

Figure 4: Dedollarization policy measures



(outstanding amount higher than USD 10 million and maturity longer than 3 years) due to the lack of information on the maturity of each credit, we control for those loans larger than USD 10 million.

3 Empirical strategy

We evaluate the impact of the dedollarization policy measures on the currency substitution of credit to soles by using a panel estimation with fixed effects.

The Peruvian financial system simultaneously obtains funding and allocates its credit portfolio in two currencies (soles and dollars), so credit allocation by currency acts as imperfect substitutes. Thus, our estimation considers fixed effects in time and firm dimensions to control for changes in the type, volume and currency composition of credit demand by firms. Some of these controls are observable while others are not, such as the firms net worth, their investment opportunities, informational frictions and agency costs between banks and firms, hetrogeneous risk taking profiles and firm access

to collateral.Those unobservable features are partially controlled using fixed effects at the bank and firm levels.

3.1 Model specification

The equation that we estimate is given by:

$$\Delta Dollarization_{bft} = \alpha_{bf} + \sum_{j=0}^{T} \beta_j \Delta DedollarizationMeasure_t + Controls_{bft} + \gamma period_t + \varepsilon_{bft}$$

The dependent variable is the monthly variation of the credit dollarization ratio of firm f from bank b in month t. First, we concentrate on analyzing the impact of the policy measures on average dollarization indicators, that is, on how much the degree of credit dollarization of a particular firm falls after the implementation of policy measures, conditional on firm f having some of its credit in dollars in period t-1.

The main explanatory variables are the dedollarization policy measures. In order to do that, we consider a set of dummy variables that turn on from the month when the policy measure is announced to the date when each measure must be implemented completely (see Table 3). We also include fixed effects by firm and time.

In order to calculate the impact of the policy measures we control on a number of dimensions such as (i) macroeconomic variables, (ii) variables related to characteristics of the bank that is granting the loan, and (iii) variables related to characteristics of the firms that take the loans. The first group includes variables such as GDP growth, inflation rate, exchange rate depreciation, spread between lending rates in soles and in dollars, exchange rate volatility and expected exchange rate fluctuations.

The second group includes variables related to bank profitability (return on assets), solvency (capital to asset ratio), credit risk (non-performing loans) and liquidity (ratio of liquid assets to total assets).

To control for quantity and quality of the demand for credit from firms, we include variables that capture firm specific characteristics. One way is to include fixed effects at the firm level. Also, we have some information on the amount of outstanding credit by each firm and its credit rating. Also, we are able to identify those firms that do foreign trade transactions and those that have access to financial hedge against exchange rate fluctuations.

We also estimate the effect of the policy measures on the growth rate of new loans and amortization of existing loans in both currencies to assess the effect on the aggregate credit dollarization ratio. In order to do that, we estimate an equation for the flow of new credit for firm f in month t in currency k and the impact of the dedollarization

measures on this variable. Also, we estimate the impact of the policy measures on the amortization of existing credit of firm f in month t in currency k, conditional on firm f having positive oustanding stock of credit in dollars in month t-1.

$$\Delta NewLoansUSD_{bft} = \alpha_{bf} + \beta \Delta DedollarizationMeasures_t + Controls_{bft} + \gamma period_t + \varepsilon_{bft}$$

$$\Delta AmortizationUSD_{bft} = \alpha_{bf} + \beta \Delta DedollarizationMeasures_t + Controls_{bft} + \gamma periodo_t + \varepsilon_{bft}$$

4 Results

In this section we present the results of the empirical estimations. Table 4 shows the results for the total sample of firms in our dataset and analyze if there are any heterogeneous impacts by the type of banks that provide the loans.

Results in Column (1) consider the average impact of dedollarization policy measures on the ratio of credit dollarization for all banks in our sample. We find that, even in the period before the implementation of the policy measures, there already was a slight downward trend for credit dollarization, with a 0,2 percentage point reduction on average for the whole sample. However, policy measures contribuyed to accelerate the pace of dedollarization, especially after the announcement of the 2015 set of policies at the end of February. This set of measures had an average monthly reduction in the credit dollarization ratio of 0,18 and 0,14 percentage points for the policy measures that needed to be implemented by June and December 2015, respectively.

Column (2) shows that before the adoption of these policy measures, different types of banks had differentiated strategies. For instance, banks that target mainly small firms, on average, had a faster credit dedollarization proccess. This results could be reflecting that banks are improving their risk management profile in terms of exposure to clients with currency mismatches, where smaller firms have mostly income in domestic currency and are less able to obtain financial hedge against exchange rate fluctuations.

Column (3) additionaly calculates heterogeneous impacts for the dedollarization measures depending on the type of bank. Even though on average, dedollarization policy measures adopted in 2013 do not show significant currency subsitution in the credit portfolio, this effect is significant for a subsample of banks. Those banks with credit mainly allocated to the corporate sector and to small firms do show a significant acceleration in thhe pace of credit dedollarization.

The result for banks targeting the corporate sector might reflext that a higher proportion of their credit portfolio is denominated in foreign currency, whereas the

Table 4: Determinants of the credit dollarization ratio. Segmented by type of bank

Dependent variable: Monthly variation of the credit dollarization ratio
Firms: Whole sample

Variable	(1)	(2)	(3)
Interest rate spread (PEN - USD) (-3)	0.001^{***}	0.001^{***}	0.001^{***}
GDP % var (-3)	0.002^{***}	0.002^{***}	0.002^{***}
XR volatility (-1)	-0.0093^{***}	-0.0078^{***}	-0.0078^{***}
XR expected % var	$-4e-5^{***}$	$-3e-5^{***}$	$-3e-5^{***}$
NPL (-1)	0.0001	0.0001	0.0001
Dedoll 2013	0.0006	0.0006	0.0011^{**}
Dedoll jun2015	-0.0018^{***}	-0.0017^{***}	-0.0015^{***}
Dedoll dec2015	-0.0014^{***}	-0.0013^{***}	-0.0012^{***}
Banks for corporate firms		-0.0026	-0.0012
Banks for big and medium firms		-0.0003	0.0000
Banks for small firms		-0.0011^{***}	-0.0011^{***}
Banks for consumption loans		-0.0229	-0.0280
Dedoll 2013 (corp)			-0.0218^{*}
Dedoll 2013 (big)			-0.0011
Dedoll 2013 (small)			-0.0025^{*}
Dedoll 2013 (consumption)			0.0142
Dedoll jun2015 (corp)			-0.0026
Dedoll jun2015 (big)			-0.0007
Dedoll jun2015 (small)			-0.0010
Dedoll dic2015 (corp)			-0.0056^{***}
Dedoll dic2015 (big)			-0.0016
Dedoll dic2015 (small)			0.0006
Dedoll dic2015 (consumption)			0.0608
Constant	-0.0018^{***}	-0.0018^{***}	-0.0018^{***}
Estimator	FE	FE	FE
Obsv	7231333	7231333	6953027
Firms	264787	264787	263631
F stat	106.58^{***}	71.32^{***}	38.47^{***}

*, **, *** represent significance at 10, 5 and 1% respectively.

threshold that they must converge to is uniform for all banks. Therefore, these banks need to have a more agressive strategy of currency substitution in order to comply with the new policy measure and avoid the cost of an additional reserve requirement.

In the case of banks targeting small firms, their credit portfolio is more likely exposed to credit risk stemming from those firms currency mismatches, so both from the banks and the firms side currency substitution of credit towards domestic currency is more desirable.

On the other hand, the dedollarization policy measures announced at the beginning of 2015 show a more uniform result, where all banks had proper incentives to substitute dollar-denominated credit to domestic currency. The results are similar both for measure needed to be implemented by June and December 2015.

Stylized facts previously shown in Figure 2 point towards larger credits being mostly denominated in foreign currency. Thus, we also analyze whether there are heterogeneous effects by the size of the loans. This could reflect two possible strategies by banks to comply with the policy measure: either by (i) substituting the currency of a smaller number of loans of large size towards domestic currency or (ii) by sustituting a large number of loans of smaler size, which might entail larger transaction costs.

Table 5: Determinants of the credit dollarization ratio. Segmented by loan size

Dependent variable: Monthly variation of the credit dollarization ratio
Firms: All firms

Variable	(4)	(5)
Interest rate spread (PEN - USD) (-3)	0.001^{***}	0.001^{***}
GDP % var (-3)	0.002^{***}	0.002^{***}
XR Volatility (-1)	-0.0093^{***}	-0.0096^{***}
Expected XR % var	$-4e-5^{***}$	$-3e-5^{***}$
NPL (-1)	0.0001	0.0001
Dedoll 2013	0.0006	0.0043^{***}
Dedoll jun2015	-0.0017^{***}	-0.0006
Dedoll dec2015	-0.0013^{***}	0.0025^{***}
Loan size p25-p50	0.0011^{***}	0.0014^{***}
Loan size p50-p75	0.0023^{***}	0.0029^{***}
Loan size p75-p100	0.0049^{***}	0.0062^{***}
Dedoll 2013 (p25-p50)		-0.0037^{**}
Dedoll 2013 (p50-p75)		-0.0056^{***}
Dedoll 2013 (p75-p100)		-0.0048^{***}
Dedoll jun2015 (p25-p50)		-0.0007
Dedoll jun2015 (p50-p75)		-0.0004
Dedoll jun2015 (p75-p100)		-0.0028^{***}
Dedoll dec2015 (p25-p50)		-0.0019^{***}
Dedoll dec2015 (p50-p75)		-0.0042^{***}
Dedoll dec2015 (p75-p100)		-0.0078^{***}
Constant	-0.0038^{***}	-0.0044^{***}
Estimator	FE	FE
Obsv	6953027	6953027
Firms	263631	263631
F stat	76.55^{***}	67.79^{***}

*, **, *** represents significance to 10, 5 and 1% respectively.

Table 5 shows these results. By outstanding loan size, larger loans were more dollarized before the implementation of the policy measures. Thus, the change in the credit dollarization ratio is larger for higher percentiles of the loan size distribution (last quantile ¿p75). Results are consistent with a strategy of dedollarizing larger loans to meet the policy measure threshold, as the coefficients that capture the reduction in the credit dollarization ratio after the policies are higher for the highest percentiles (quantile 3 and 4) and this result is consistent for all dedollarization policy measures announcements.

We also calculate the effect on the aggregate credit dollarization ratio, as this is the indicator monitored by the Central Bank. For that purpose, we analyze the determinants of the flow of new loans and the amortization of outstanding loans by currency. Dedollarization policy measures are expected to contribute to increasing the pace of new loans in domestic currency and to a increasing amortizations of dollar denominated loans, which would point towards a prepayment of dollar loans with new loans in soles. In this way, banks would be able to comply with the thresholds on credit in foreign currency without paying the additional reserve requirement.

Table 6: Determinants of the aggregate credit dollarization ratio

Variable	(1) newloan fc	(2) newloan fc	(3) amort fc	(4) amort fc	(5) inc credit growth fc
Dedoll measures	-0.323^{***}	-0.261^{***}	0.0257^{***}	0.0232^{***}	-0.105^{***}
	(0.0135)	(0.0160)	(0.0053)	(0.0062)	(0.00538)
XR yoy var		-0.0446^{***}		-0.0300^{***}	-0.0079^{***}
		(0.0088)		(0.0033)	(0.0030)
XR dep yoy var		0.00770^{***}		0.0361^{***}	-0.0156^{***}
		(0.0125)		(0.0048)	(0.0042)
NPL	-4.862^{***}	-4.861^{***}	-3.800^{***}	-3.800^{***}	0.134^{***}
	(0.0233)	(0.0233)	(0.0113)	(0.0113)	(0.0075)
Export dummyF2.expor	0.0105^{***}	0.0105^{***}	-0.0025	-0.0025	0.0077^{***}
	(0.0039)	(0.0039)	(0.0024)	(0.0024)	(0.0017)
FX derivative dummy	0.452^{***}	0.456^{***}	0.118	0.118	0.0254^{***}
	(0.0368)	(0.0368)	(0.0187)	(0.0187)	(0.0138)
USD loan stock			0.719^{***}	0.719^{***}	
			(0.0015)	(0.0015)	
Constant	5.171^{***}	5.089^{***}	-0.527^{***}	-0.559^{***}	
	(0.0468)	(0.0478)	(0.0222)	(0.0225)	
Additional constrols					
Type of bank	Yes	Yes	Yes	Yes	Yes
Credit segment	Yes	Yes	Yes	Yes	Yes
Obsv	603283	603283	1713593	1713593	3202294
R squared	0.149	0.149	0.216	0.216	
Firms	72834	72834	78672	78672	70219

Standard errors in parenthesis. *, **, *** represent significance of 10, 5 y 1% respectively.

Results in Table 6 show that the adoption of the dedollarization policy measures reduced the pace of new loans in foreign currency (columns (1) and (2)), whereas amortization of foreign currency credit increased its pace (columns (3) and (4)). Also, column (5) shows and acceleration in the downward trend of foreign currency credit flows. Notice also that there is a positive correlation between firms that have access to financial hedging useing FX derivatives (FX derivative) and the origination of new loans in foreign currency, which provides some evidence that some proportion of dollar loans do not pose currency risk as they would be equivalent to a synthetic of a domestic currency loan when we include the FX derivative as hedge.

5 Conclusions and Further Extensions

The aim of this paper is to assess and quantify the impact of the set of dedollarization policies that the BCRP implemented between 2013 and 2016 in order to reduce the exposure of bank credit to a sudden and sharp exchange rate depreciation. In order to do that, we use granular credit register data and calculate the impact on the average credit dollarization ratio and on the aggregate credit dollarization indicator.

Our results support the effectiveness of these policy measures to speed up the pace of credit de-dollarization, especially after the announcement of the policy measures of 2015. The effect of policy measures in 2013 were more limited to banks that target particular market segments, such as corporates and small firms. By loan size, banks dedollarization strategy for their credit portfolio was linked to currency substitution of large loans.

Aggregate credit dollarization indicators also verify that de-dollarization policies helped to substitute the currency composition of loans towards soles, by increasing the pace of amortization of outstanding dollar loans and reducing the allocation of new loans in dollars and increasing new loans in soles.

Future extensions of this work could include additional robustness checks to control firm characteristics and include a difference in difference approach. Other future lines of research migth include the complementarity of credit dollarization and the currency composition of funding avaiable for banks. In this line, since 2015, de-dollarization measures were accompanied by BCRP supplying cyrrency repos to banks with large maturity, so that they could substitute funding using dollar deposits for domestic currency funding (for more details, see Castillo and Humala (2017)). Thus, an analysis of the policy measures together with the funding structure of banks would be complementary.

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