Assessing the impact of credit de-dollarization measures in Peru

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The opinions expressed in this article correspond to the authors and does not necessarily reflect the position of the Central Reserve Bank of Peru.

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Summary

- Objective:
  - This paper measures the impact of the De-dollarization Program implemented by BCRP, on the dollarization ratio of credit to private firms in order to reduce their exposure to currency risk.
- Methodology:
  - Average dollarization ratio: (i) Panel with fixed effects and (ii) difference in difference estimation with monthly data on credit by currency at the firm-bank level.
  - Aggregate dollarization ratio: Panel estimation with monthly data on new credit flows and amortization of existing loans.
- Results:
  - Since the first announcement, 6 out of the 10 percentage point reduction in credit dollarization is related to the De-dollarization Program.
  - General impact of measures in 2015+ on all segments; but previous measures in 2013 affected only segments of corporate and small firms.
  - Results show that, in order to comply with the thresholds for credit in foreign currency, banks strategy included: (i) a reduction in the growth rate of new loans in foreign currency and (ii) an increase in early amortization of credit in dollars (substitution to soles).

Table of contents

Motivation

- High degree of financial dollarization as one of the main risks of the Peruvian financial system.
  - Reduction in credit dollarization from 78 percent in 2001 to 43 percent in 2012. But still higher than most economies in the region.
- Thus, BCRP complements its IT regime with FX interventions and macroprudential tools such as reserve requirements. In addition, BCRP adopted the Dedollarization Program, an additional reserve requirement on credit in foreign currency following certain thresholds in order to reduce exposure to currency risk. The objective of this policy measure was to reduce the ratio of credit dollarization.

This work

- This work quantifies the impact of the Dedollarization Program on the currency composition of credit by the banking sector to private firms, and identifies the existence of heterogeneous impacts by credit segment, economic sector and loan size.
- We use the dataset from the credit register central (RCC) at the bank-firm level with monthly data December 2010 and December 2017.
- The empirical methodology follows: (i) a panel estimation with fixed effects and (ii) estimations with a difference in difference approach for robustness.
- We include a set of control variables on different dimensions, given the benefit of having a very high degree of granularity (macroeconomic, bank level and firm-level variables).

Literature Review

Use of granular data from RCC to analyze monetary policy and macroprudential policy effectiveness

- Use of macro-prudential policies and their effect on credit growth: (i) capital requirements (Aguirre and Repetto, 2017), reserve requirements (Barata Barroso et al. (2017), Cabello et al. (2017), Gomez et al. (2017)), and dynamic provisions (Cabello et al. (2017), Gomez et al. (2017), Jiménez et al. (2017)).
- The credit channel of monetary policy and its transmission mechanism using loan-level data (BIS CGDFS Working Group 2018: Barbone (2018), Biron et al (2018), Bustamante et al (2018), Cantu et al (2018), Morales et al (2018)).

Literature Review

Impact of MaPP on financial risk exposures, such as the impact on credit risk taking by the banking sector (Jiménez et al. (2012), Jiménez et al. (2014)).

Credit in foreign currency: heterogeneous effects on credit growth by currency of both MaPP (Epure et al. (2018), Camors and Peydro (2014)) and monetary policy (Ongena et al., 2014).

Impact of macroprudential policies in Peru using aggregate data: counterfactual analysis of the use of RR in dollars and the de-dollarization program (Castillo et al., 2016) and the effect of traditional (deposit) RR shocks at the bank level (Vega and Chavez, 2017).

Granular data on credit to households: stylized facts of household credit dollarization in Peru (Céspedes, 2017) and the impact of credit rating revisions on NPL and access to credit (Garmaise and Natividad, 2017).

Table of contents

Credit Dedollarization Program

Figure 1: Additional Reserve Requirements in Foreign Currency
(Banco Central de Reserva del Perú, 2015)

ADDITIONAL RESERVE REQUIRENMENT ACCORDING TO CREDIT IN FOREIGN CURRENCY

In force	As of June 2015	
	Limits*	**Additional RR**
Total excluding foreign trade[1/] (Base=Sep.13)	0.95 times from Sep.13 or 0.92 times from Dec.14 or 100% PE or US$ 100 MM	$0.3 \times \left(\frac{C_t}{C_{s13}} - 0.95\right) \times PT$
Car and mortgage (Base=Feb.13)	0.90 times from Feb. 13 ó 0.86 times from Dec. 14 ó 20% PE	$0.15 \times \left(\frac{CHV_t}{CHV_{f13}} - 0.90\right) \times PT$

In force	As of December 2015	
	Limits*	**Additional RR**
Total excluding foreign trade[1/] (Base=Sep.13)	0.90 times from Sep.13 or 0.85 times from Dic.14 or 100% PE or US$ 100 MM	$0.3 \times \left(\frac{C_t}{C_{s13}} - 0.90\right) \times PT$
Car and mortgage (Base=Feb.13)	0.85 times from Feb.13 or 0.75 times from Dic.14 or 20% PE	$0.15 \times \left(\frac{CHV_t}{CHV_{f13}} - 0.85\right) \times PT$

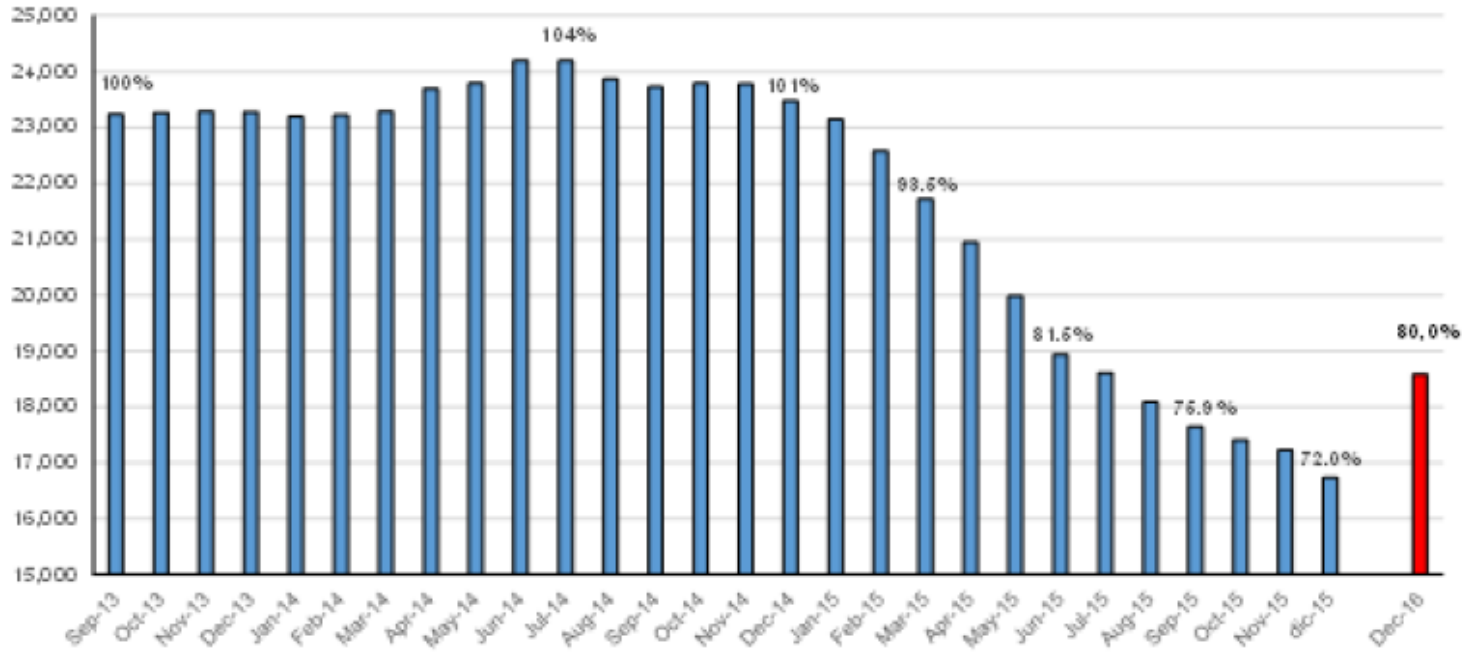
Approved	As of December 2016	
	Limits*	**Additional RR**
Total excluding foreign trade[1/] (Base=Sep.13)	0.80 times from Sep.13 or 100% PE or US$ 100 MM	$0.3 \times \left(\frac{C_t}{C_{s13}} - 0.80\right) \times PT$
Car and mortgage (Base=Feb.13)	0.7 times from Feb.13 or 15% PE	$0.15 \times \left(\frac{CHV_t}{CHV_{f13}} - 0.7\right) \times PT$

1/ Excludes new loans from January 2015 (terms more than 3 years and higher than US$ 10 million).
* These limits don't apply if the total balance of loans in foreign currency excluding foreign trade is less than the effective equity and the balance of car and mortgage loans if less than 20 percent of effective equity.

Credit Dedollarization Program

Successful reduction in the stock of credit in foreign currency before the end-date of the policy measure.

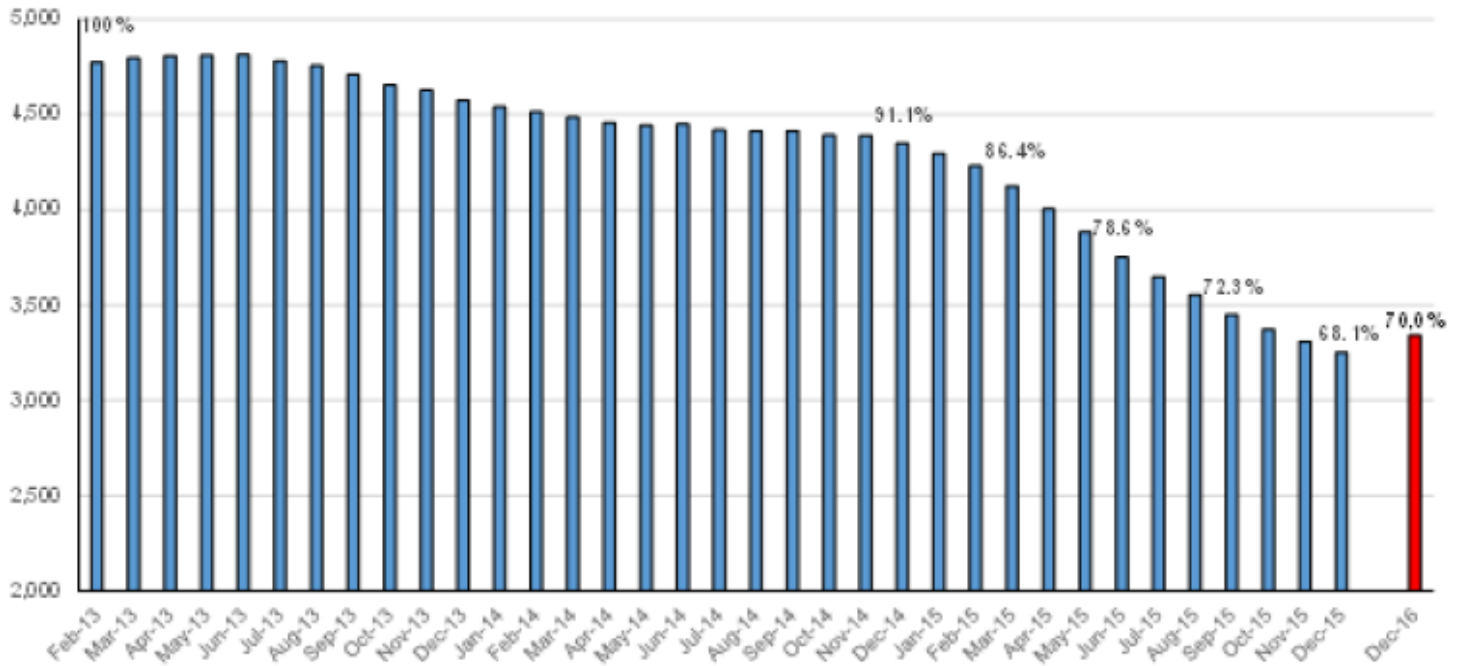
Figure 2: Bank Credit in Foreign Currency Excluding Trade Loans
(September 2013=100; in millions of U.S. dollars)
(Banco Central de Reserva del Perú, 2015)



Credit Dedollarization Program

Significant reduction of the credit stock in foreign currency to households, especially car loans and mortgage loans.

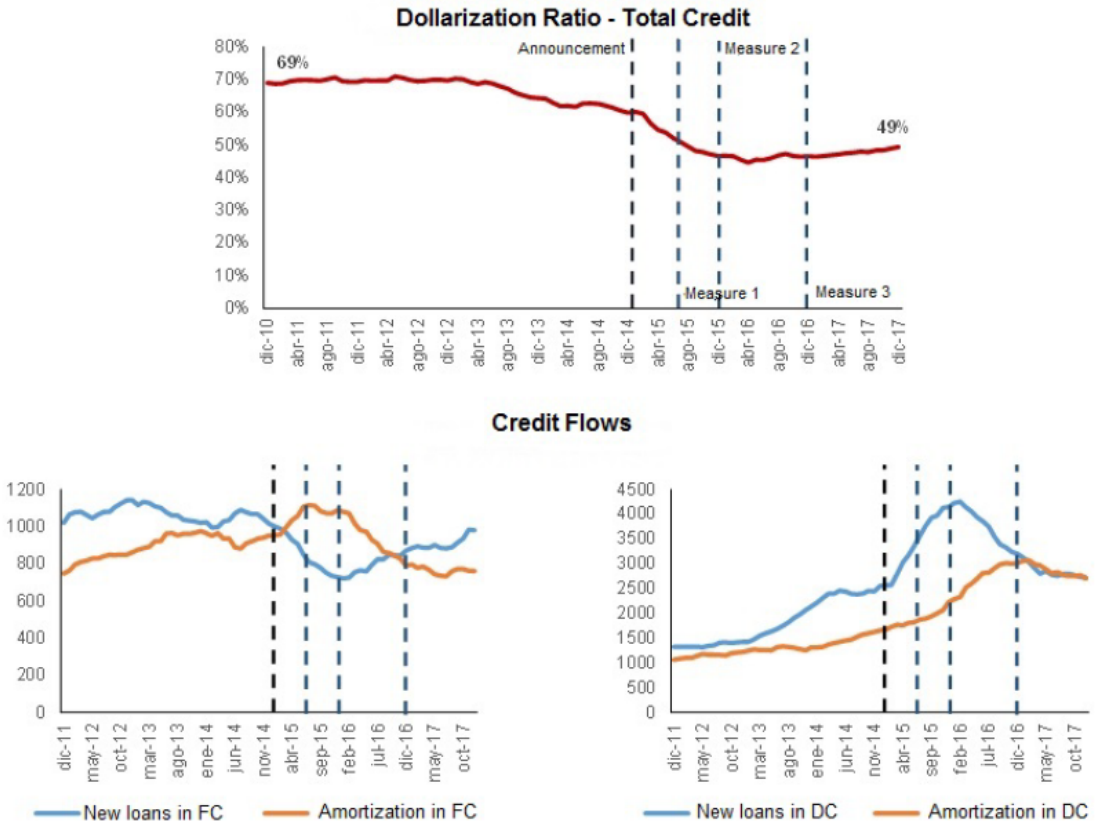
Figure 3: Banks Car and Mortgage Loans in Foreign Currency
(February 2013=100; in millions of U.S. dollars)
(Banco Central de Reserva del Perú, 2015)



Credit Dedollarization Program

(i) Currency substitution in new loans (reduction in new dollar loans and higher growth rates for loans in soles) and (ii) currency substitution in outstanding loans (pre-payment of dollar loans using new loans in soles).

Figure 4: De-dollarization policy measures



Credit Dedollarization Program

The success of this program depended on banks having enough funding in soles, so that the credit in soles could be expanded as planned. Thus, BCRP injected liquidity in soles through currency repo operations.

Figure 5: Total Stock of Currency Repo Operations
(in millions of soles)

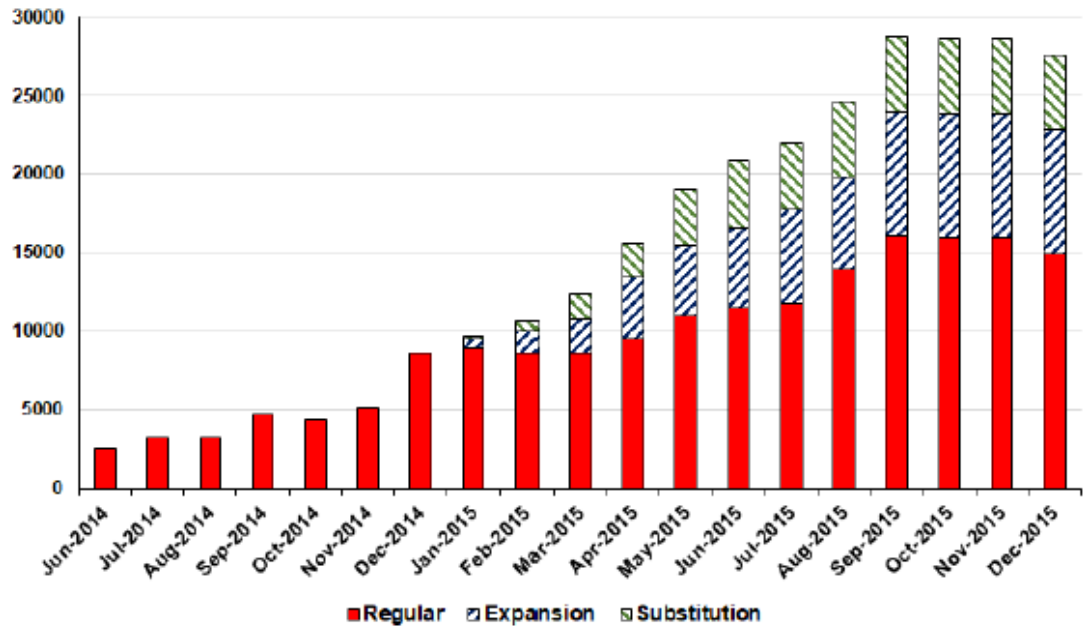
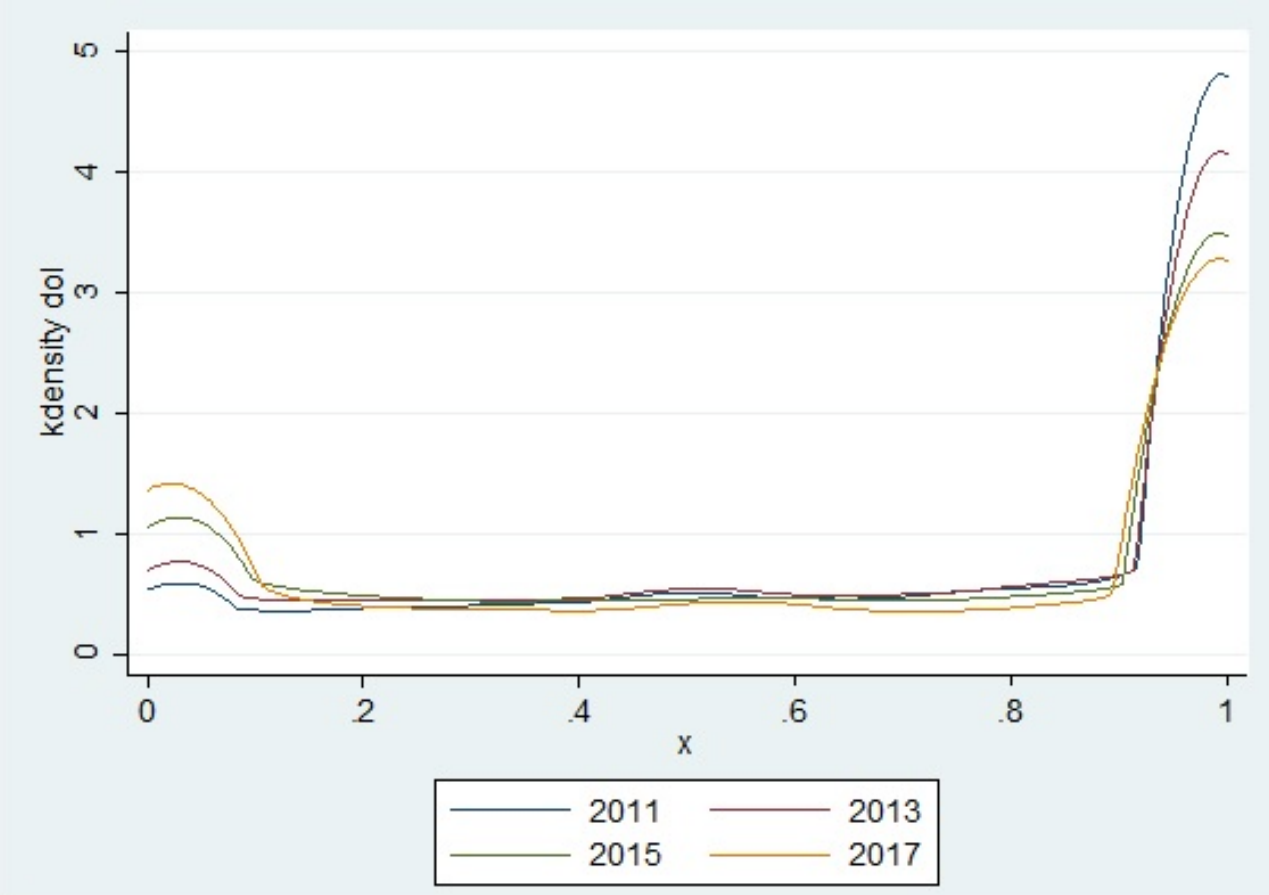


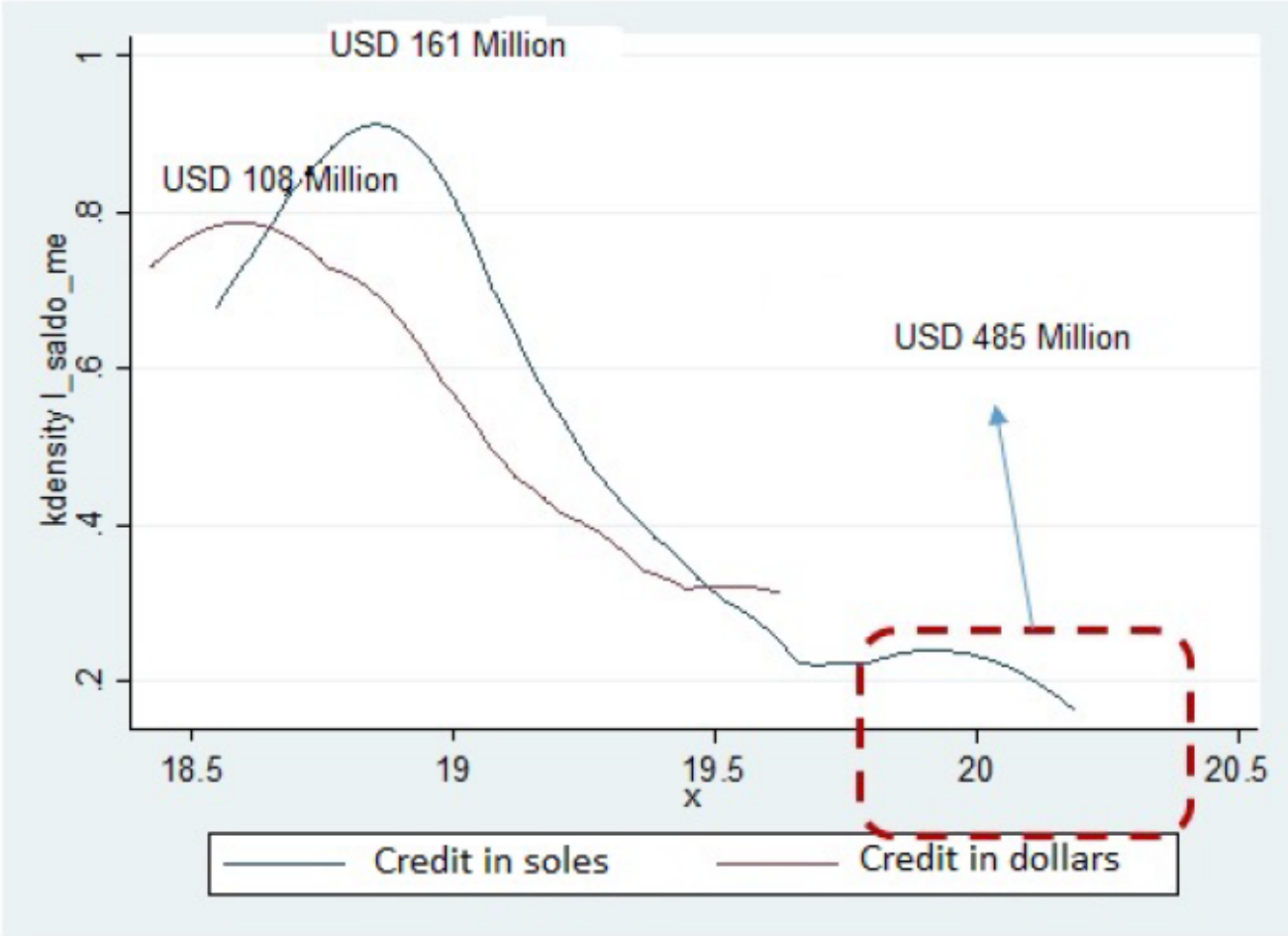
Table of contents

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



Distribution of the credit stock in domestic and foreign currency by loan size

Figure 7: Outstanding credit stock distribution at the firm level: credit in soles and dollars (in logs)
December 2017



Dedollarization by economic sector and segment

Table 2: Contribution to credit de-dollarization 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		

Table of contents

Average Dollarization at the Firm Level - Panel with fixed effects

Consider the following equation:

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

$Dollarization_{bft}$: monthly variation of the ratio of dollarization of outstanding credit taken by firm f from bank b in month t.

$DedollarizationMeasures_t$: dummies that activate at the date of announcement of the policy measures until the end-date of each policy measure.

Question: Conditional on firm f having part of its credit stock in dollars in t-1, how much did the ratio of credit dollarization decrease after the implementation of the Dedollarization Program?

Average Dollarization at the Firm Level - Panel with fixed effects

Control variables:

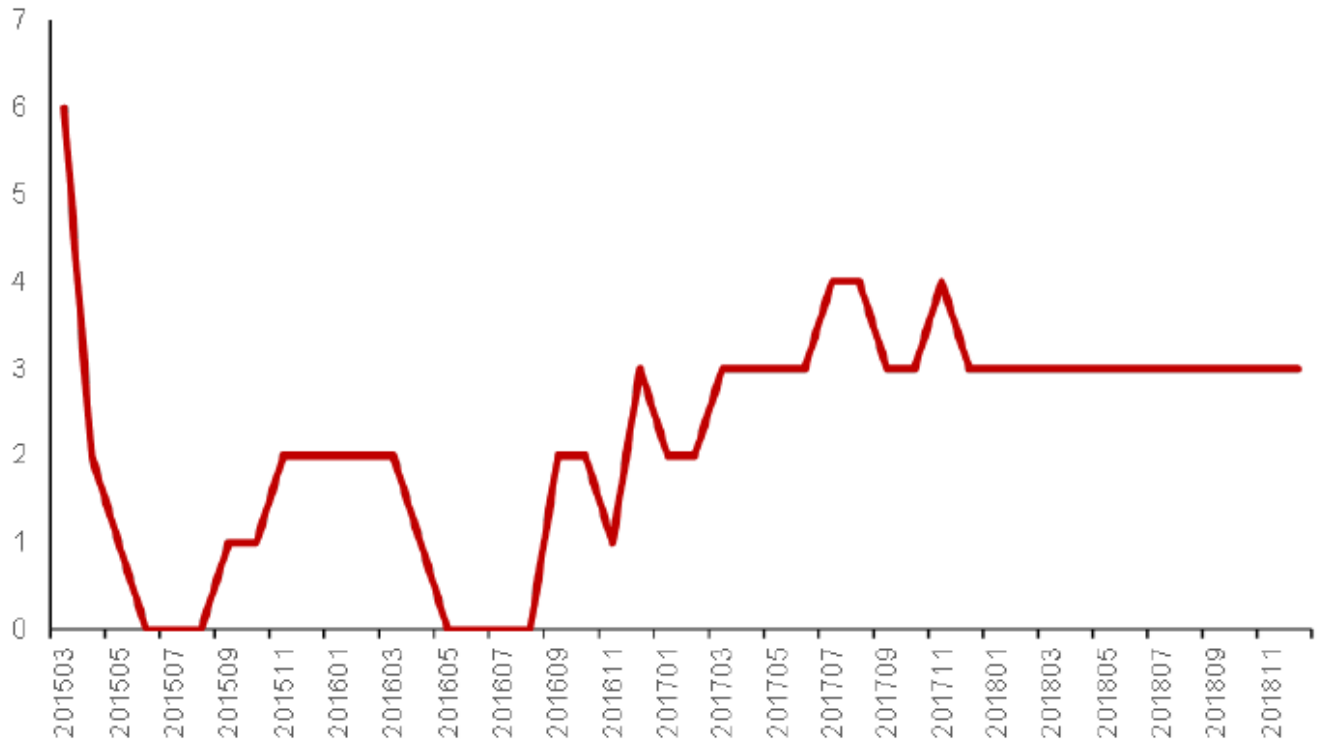
- Macroeconomic variables: GDP growth, inflation rate, exchange rate, interest rate differential between PEN and USD, exchange rate volatility, expected exchange rate depreciation.
- Bank-level characteristics: profitability (ROA), solvency (capital ratio), delinquency (NPL) and liquidity (liquid assets ratio).
- Firm-level characteristics: credit rating, foreign trade identifier, access to FX hedge in derivatives market identifier.

Average Dollarization at the Firm Level - Difference in difference estimation

- Robustness to isolate the causal effect of the de-dollarization policy measures on the ratio of credit dollarization.
- Given that these policies affect all economic agents we need to identify some variation for the treated vs control groups.
- The granularity of the data allows us to identify those banks that were above the thresholds for the stock of credit in foreign currency.
- Thus, our treated group includes those firms that took more than 50 percent of their total loans from banks that were above the thresholds for the stock of credit in foreign currency by the time of the announcement of the policy.

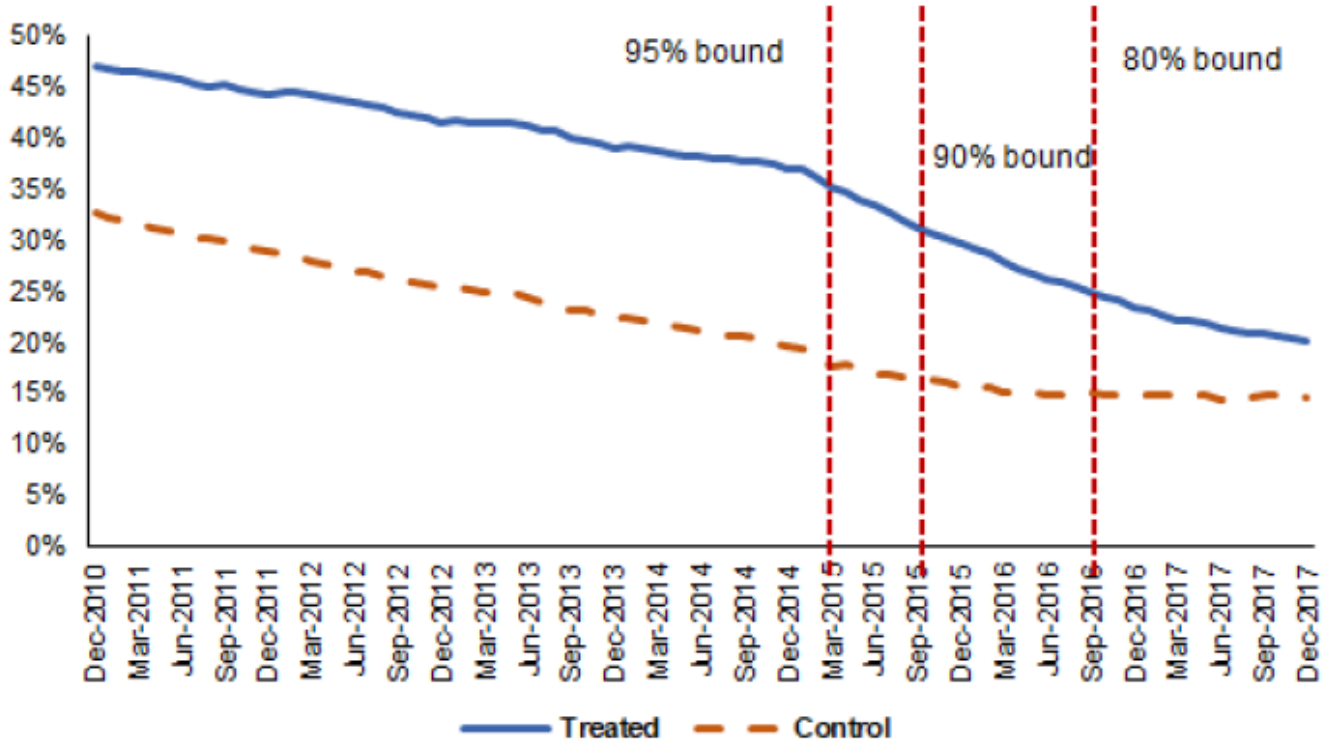
Average Dollarization at the Firm Level - Difference in difference estimation

Figure 9: Number of constrained banks



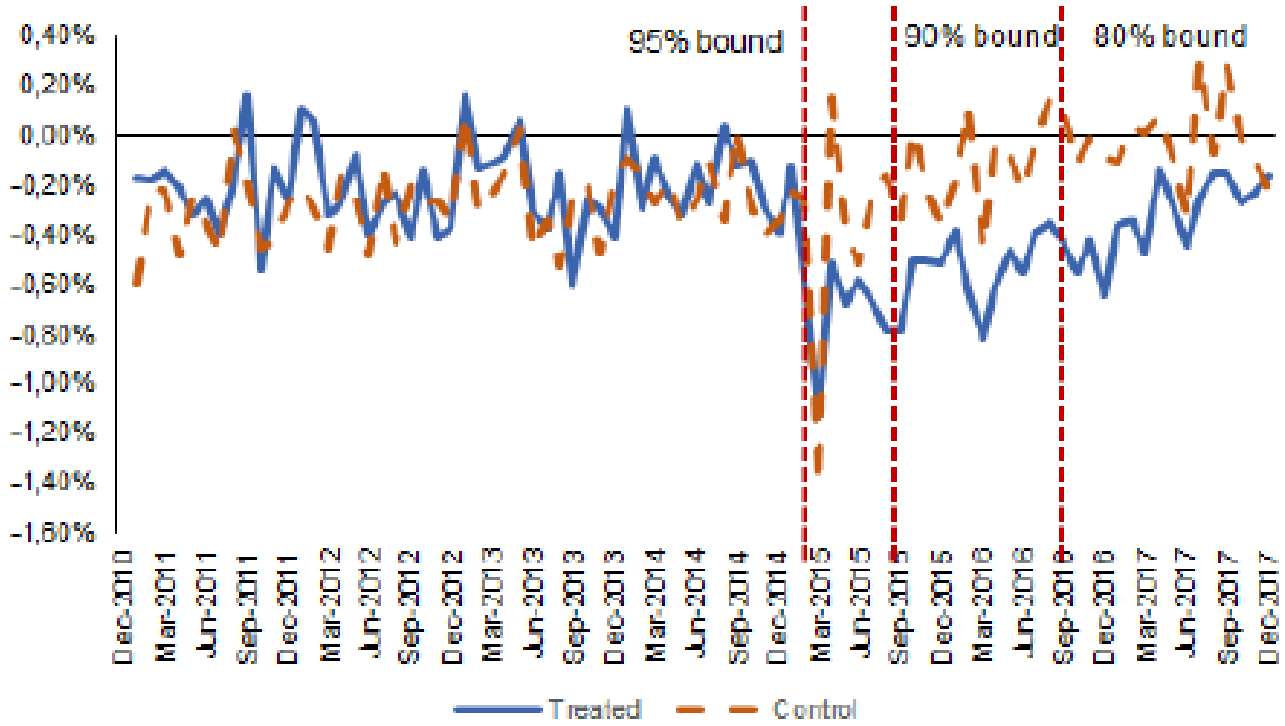
Average Dollarization at the Firm Level - Difference in difference estimation

Figure 10: Dollarization ratio, treated and control groups



Average Dollarization at the Firm Level - Difference in difference estimation

Figure 11: Variation in dollarization ratio, treated and control groups



Average Dollarization at the Firm Level - Difference in difference estimation

Following Cameron and Trivedi (2005), consider the following equation for the change in the credit dollarization coefficient, y_{it}:

$$y_{it}^{j} = \alpha + \alpha_1 D_t + \alpha^1 D^j + \beta D_t^j + \gamma Controls_{it}^{j} + \varepsilon_{it}^{j}$$

We compare before and after the policy intervention (adoption of de-dollarization measures), where D_t^j considers period t equal to 1 after intervention and 0 before intervention; and for each j group, equal to 1 if treated and to 0 if untreated.

β captures the marginal effect of the de-dollarization measures on the treated group.

$$\begin{aligned}(y_{i1}^{1} - y_{i0}^{1}) - (y_{i1}^{0} - y_{i0}^{0}) = \beta + \gamma((Controls_{i1}^{1} - Controls_{i0}^{1}) \\ -(Controls_{i1}^{0} - Controls_{i0}^{0})) + (\varepsilon_{i1}^{1} - \varepsilon_{i1}^{1}) - (\varepsilon_{i1}^{0} - \varepsilon_{i1}^{0})\end{aligned}$$

New Loans and Amortizations by Currency - Panel estimation

Consider the following equations:

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

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

Table of contents

Average Dollarization - Panel with Fixed Effects

Table 3: 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
Obs	7231333	7231333	6953027
Firms	264787	264787	263631
F stat	106.58***	71.32***	38.47***

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

Average Dollarization - Panel with Fixed Effects

Table 4: 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
Obs	6953027	6953027
Firms	263631	263631
F stat	76.55***	67.79***

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

New Loans and Amortizations - Panel with Fixed Effects

Table 5: 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.

Average Dollarization - Difference in difference estimation

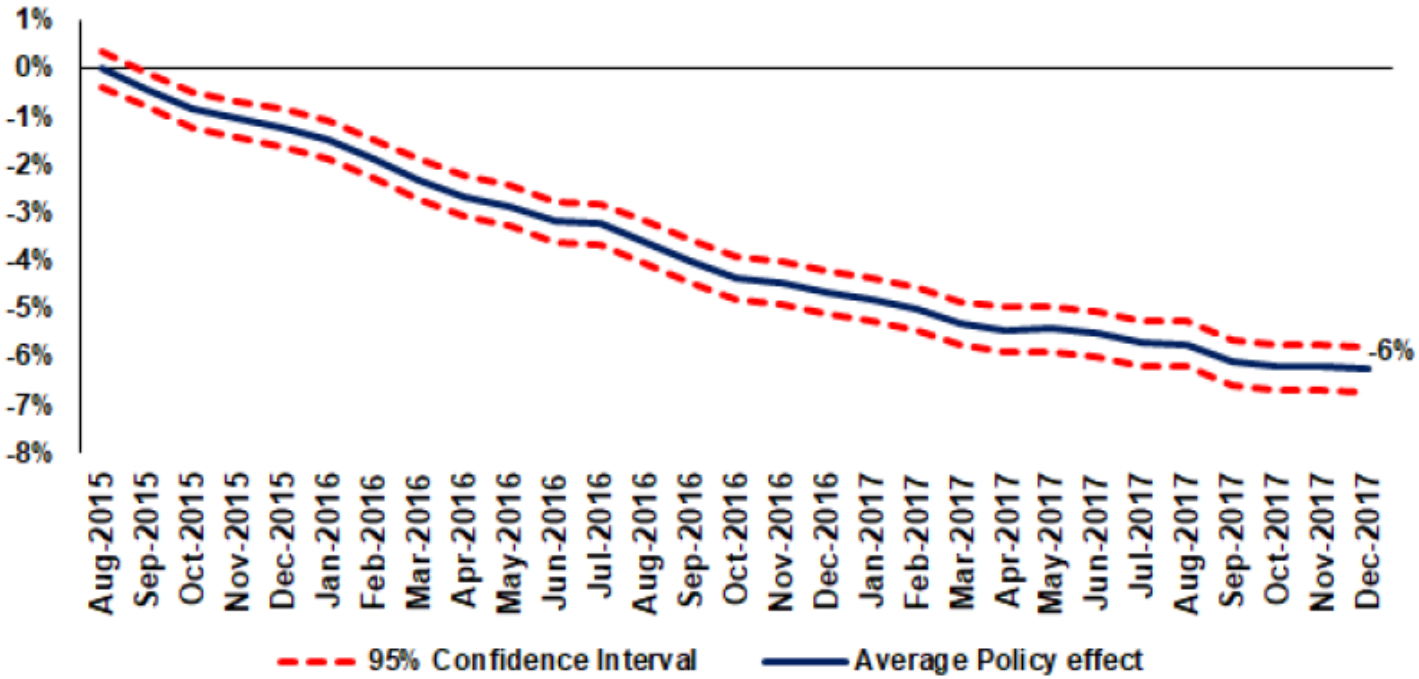
Table 6: Estimated effect through a Difference-in-difference approach

Variables	(DID estimator) dol	(Control by demand factors) dol	(Control by supply factors) dol	(All controls) dol
treatment_9	-0.0124***	-0.0123***	-0.0122***	-0.0122***
	(0.00199)	(0.00199)	(0.00199)	(0.00198)
treatment_15	-0.0319***	-0.0321***	-0.0322***	-0.0324***
	(0.00217)	(0.00217)	(0.00216)	(0.00216)
treatment_21	-0.0468***	-0.0472***	-0.0469***	-0.0474***
	(0.00229)	(0.00228)	(0.00228)	(0.00228)
treatment_27	-0.0553***	-0.0560***	-0.0562***	-0.0568***
	(0.00237)	(0.00237)	(0.00236)	(0.00236)
treatment_33	-0.0627***	-0.0635***	-0.0633***	-0.0641***
	(0.00245)	(0.00244)	(0.00243)	(0.00243)
expor		6.90e-05		6.51e-05
		(0.000187)		(0.000192)
impor		0.00138***		0.00138***
		(0.000261)		(0.000262)
usa_der_me		-0.172***		-0.169***
		(0.00592)		(0.00590)
cartera_morosa			0.0431***	0.0420***
			(0.00112)	(0.00112)
Constant	0.329***	0.329***	0.329***	0.330***
	(0.00125)	(0.00125)	(0.00125)	(0.00125)
Observations	7,766,995	7,766,995	7,766,995	7,766,995
R-squared	0.041	0.044	0.043	0.046
Number of firms	333,799	333,799	333,799	333,799

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Average Dollarization - Difference in difference estimation

Figure 12: Average effect of a Policy measure implemented in January 2015



Average Dollarization - Difference in difference estimation

Table 7: De-dollarization policy effect importance

	2010-2014	2014-2015	2014-2016	2014-2017
Observed	-9.7 %	-5.7 %	-9.0 %	-10.6 %
Due to Policy	0 %	-1,2 %	-4,7 %	-6,3 %
Importance	0 %	21,6 %	51,9 %	59,3 %

Results - Summary I

- The reduction in the ratio of credit dollarization increased its pace after the announcement of the Dollarization Program. Panel estimations show an average monthly effect of 0,18 and 0,14 percentage point reduction after the announcement of the June and December 2015 measures, respectively.
- General impact of measures in 2015+ on all segments; but previous measures in 2013 affected only segments of corporate and small firms.
- Since the first announcement, 6 out of the 10 percentage point reduction in credit dollarization is related to the De-dollarization Program.
- Results show that, in order to comply with the thresholds for credit in foreign currency, banks strategy included: (i) a reduction in the growth rate of new loans in foreign currency and (ii) an increase in early amortization of credit in dollars (substitution to soles).

Conclusions I

- We find evidence of a significant reduction in the ratio of credit dollarization related to the adoption of the Dedollarization Program.
- Further work could do a similar analysis on the policy measures related to household credit (mortgages and car loans) At first glance, the ratio of credit dollarization in those segments fell by a larger magnitude than for credit to firms.

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