Financial Dollarization: Evidence from a Survey on Branches of Cambodian Financial Institutions*

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1. Introduction

Dollarization, which is a phenomenon where local economic agents use foreign currency in their asset holding and transaction, is the growing issues over the world. In particular, the dollarization is heavily prevailed in developing countries, in which financial systems are still immature, and which are sometimes politically unstable. While the dollarization is sometimes a consequence of the weak financial system and lack of trust in local currency and governments, it undermines the monetary policy of a central bank in a country.

There are a growing number of previous studies which have investigated the financial dollarization from theoretical and empirical points of views. Ize and Levy-Yetagi (2003) theoretically argues that portfolio selection model can explain the economics agent's incentive to hold foreign currency (FX) assets and borrowings. Some of empirical previous studies find the consistent results in household data (Firdmuc et al., 2013; Beckman and Stix, 2015). In addition, Jeanne (2003, 2005) provides the theoretical model to explain the firm's FX borrowing, and there are also a lot of previous studies which empirically investi-

gate the firm's behaviors (Brown et al., 2011; Kamil, 2012)

Along with other economic agents, such as households and firms, financial institutions play a significant role in dollarization. Brown et al. (2014) investigated the loan-level data of a Bulgarian bank, and found that it is likely that foreign currency lending is a consequence of banks forcing firms to borrow in foreign currency, possibly due to an incentive to hedge the risk of currency mismatch. Recent studies on banks' behaviors in foreign currency lending suggest that there might be heterogeneity in the banks' behavior, which comes from differences in funding sources or ownership structures (Brown and Da Haas, 2013). Furthermore, Brown et al. (2015) found that there are also regional differences in the extent of deposits and loan dollarization within a country, due to differences in regional inflation rates and other regional factors.

While several previous studies have investigated dollarization in the banking sector in Cambodia using macro-level data (Zamaroczy and Sa, 2002; Menon, 2008; Duma, 2011), no studies have been done on the behaviors of individual financial institutions in Cambodia, although banks' funding sources and target customers are different across types of financial institutions and banks' behaviors are also different across institutional types.

In our study, we collected data from 15 main Cambodian financial institutions: 10 commercial banks (CBs) and 5 deposit-taking microfinance institutions (MDIs). In general, commercial banks emphasize profits and collect funds in the form of deposits, while MDIs collect funds by borrowing from other financial or non-financial institutions, apart from deposits from public. In this paper, we investigate the currency compositions of banks' assets and liabilities, using financial data from banks' branches. In Cambodia, there have been no studies on foreign currency lending and deposits of individual financial institutions, even though Cambodia is one of the most dollarized economies. In this regard, we conducted a survey on headquarters and branches of 10 CBs and 5 MDIs in 2014. In the survey, we collected information on currency compositions of balance sheets

and income statements for both consolidated and branch-level disaggregated ones. Our study is the first study using individual bank and branch data to reveal how much banks lend in foreign currency and which factors may affect their behaviors in Cambodia.

As a result, we found that there were differences in the currency composition of loans and deposits among types of financial institutions and among regions. (1) We found that CBs rely much more on FX currency in their operations than MDIs. (2) The shares of local currency in deposits have been stable from the period of 2009 to 2013, despite recent rapid growths in the amounts of total deposits. (3) We found that financial institutions were likely to allocate excess funds to branches which were short of funds. However, commercial banks did not allocate KHR funds, although they had large excesses of KHR funds in Phnom Penh. (4) In rural areas, shares of FX currency in loans and deposits were lower than Phnom Penh, although there were indications that shares of FX currency of loans have been increasing in rural areas during the period of study. (5) We also found that shares of FX currency in MDI deposits have decreased in both rural and urban areas. This might be because recent improvements in financial inclusion have allowed people in rural areas, who are mainly using KHR in their daily transaction, to have access to bank deposits. We believe that these findings are helpful for policy-making toward de-dollarization in Cambodia and other countries which experience the same situations.

In the rest of our paper is structured as follows. We present the review of literature of dollarization in Cambodia, and briefly describe the institutional details of the Cambodian banking sector in the second and third sections, respectively. We describe the detail of the data used for analysis in the fourth section, and the results of our empirical analysis in the fifth section. In the sixth section, we draw policy implication and conclude.

2. Literature Review on Dollarization in Financial Systems

　　Some previous research has argued that hedging behaviors in currency mismatch and profit maximizing would be the factors driving foreign currency lending in dollarized economy. Basso et al. (2010) examine aggregate credit dollarization for 24 transition countries over the period of 2000–2006. They find that countries in which banks have a higher share of foreign funding display a higher share of FX loans, meaning that dollarization could be the consequence of banks' adjustments of the currency composition between their assets and liabilities. Similarly, using cross-country data, Lucas and Petrova (2008) found that sources of fund in term of deposit dollarization can impact foreign currency lending, while the foreign liability of banks has no relation to FX lending

　　Some previous studies find evidence that there is heterogeneity in banks' behaviors in foreign currency lending. In particular, the extent of foreign currency lending by banks seems to be dependent on banks ownership and accessibility of foreign borrowing. De Haas and Naaborg (2006) and De Haas and Van Lelyveld (2006, 2010) show that parent bank funding, typically denominated in FX currency, influences the credit growth of foreign subsidiaries. To the extent that subsidiaries do not swap these funds into local currency, access to parent bank funding may have a positive impact on FX lending. Degryse et al. (2011) provide evidence that FX lending in Poland is related to bank ownership, by examining individual Polish banks during the period from 1996–2006. They find that green-field foreign-owned banks provide more FX loans than domestic banks or foreign-owned banks. Brown and Da Haas's (2013) study on foreign banks and foreign currency lending in emerging Europe using bank-level data from 2001 to 2004, consisted of 95 foreign-owned banks and 98 domestic banks in 20 transition economies of Eastern Europe. They find that banks with more foreign currency shares in deposits tend to extend loans in foreign currency, regardless of the ownership structure.

　　In addition to the heterogeneity in banks' behaviors, Brown et al. (2015) sug-

gest that there are regional differences in the extent of dollarization within a country. They employed data of aggregated amounts of deposits and loans by regions in Russia, and find that the regional inflation rates affect the extent of regional dollarization, as suggested by the theoretical argument by Ize and Levy-Yatagi (2003).

Currency choice in loans is bilateral. Both the lender and borrower sides possibly affect the choice. Using the loan application and granted loan data of one Bulgarian bank, Brown et al. (2014) investigate whether the supply side or demand side determine the currency choice in loans. The authors showed that banks' decision rather affects the choice of currency in corporate loans, since it is less risky for banks to mitigate the currency mismatch in bank assets and liabilities.

Even though Cambodia is one of the most dollarized economies, research on dollarization in the country is very limited, and there are no micro-level studies on financial institutions (Zamaroczy and Sa, 2002; Duma, 2011; Siregar and Chan, 2014). Zamaroczy and Sa (2002) empirically estimated the level of dollarization in the Cambodian economy using macro-level data. Duma (2011) did research on the cause and impact of Cambodian dollarization using macro data. She pointed out that despite macroeconomic and political stability, the level of dollarization keeps rising and surpasses the riel. She explained that there are two types of economy in Cambodia: the urban economy that is mostly dollar-based and has benefited a lot from the garment sector, tourism, FDI, and aid; and the rural economy that depends on agriculture and is riel-based. However, how banks' behaviors affect dollarization in Cambodia is still unclear.

Since Cambodia started to transform from a planned economy to a market-oriented one, a lot of foreign funds have flowed into the Cambodian banking sector in a variety of forms. Therefore, there may exist many types of financial institutions in terms of funding structures. Thus, bank behavior might be different from a bank to a bank. Furthermore, the low level of infrastructure

development, especially for transportation, leads to the low integrity of regional markets. Therefore, it is likely that the dollarization could be different from a region to a region in Cambodia. Apart from the regional factors, the difference in branch network structures may also affect the extent of dollarization in bank deposits. In our study, we employ different types of data compared to the literature, namely branch-level financial statements of commercial banks and MDIs. We believe that our study provides useful facts to understand dollarization in the banking sector.

## 3. Background of Cambodian Financial Dollarization
3.1 Trends and the Current Situation of the Cambodian Banking Sector

We briefly describe the institutional background of the Cambodian banking sector, and recent changes in the structure of their assets and liabilities. The Cambodian financial sector is composed of three types of financial institutions: commercial banks (CBs), specialized banks (SBs), and microfinance institutions (MFIs). As of 2013, CBs had about 90 percent and MFIs had about 10 percent of total assets in banking sector, while SBs had less than 1 percent. In particular, MFIs can be divided into two entities: deposit-taking MFIs (MDIs) and non-deposit-taking MFIs (NMDIs). More than 90 percent of total assets of the microfinance sector are owned by MDIs.[1]

Figure 1 shows the recent trends in the structure of assets and liabilities for CBs and MDIs. Overall, MDIs have experienced significant changes in the composition of their liabilities from 2006 to 2013. The figures also suggest that the trends are different between CBs and MDIs. As is the case in other developing countries, deposits dominate the majority of funding sources for CBs, while borrowings are more important funding sources for MDIs. However, in recent years, deposits as percentages of total liabilities have been increasing in MDIs,

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1)　In this study, we only examine MDIs.

Figure 1: Recent Trends in Structures of Assets and Liabilities
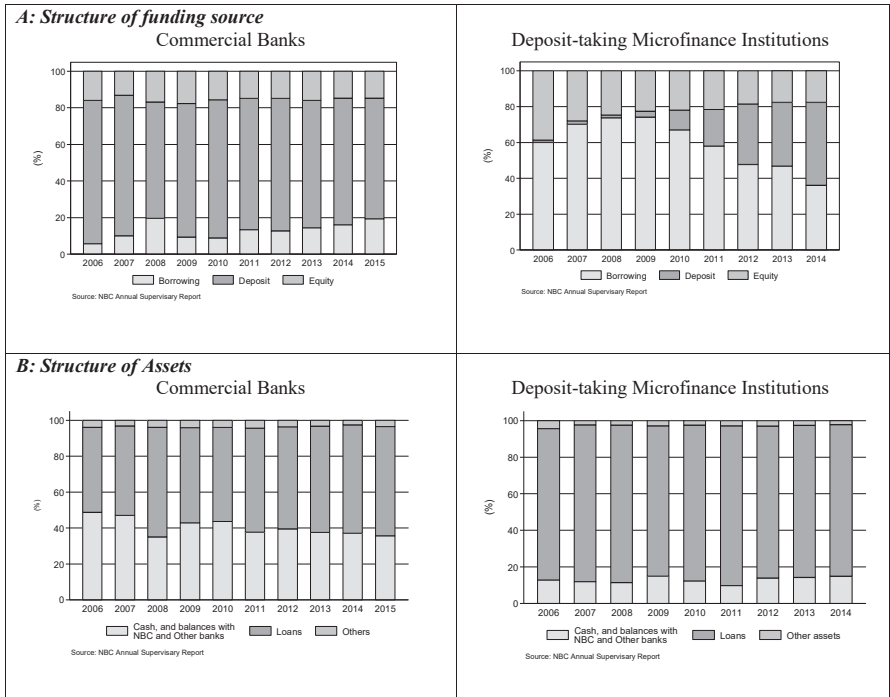
Source: Data provided by National Bank of Cambodia, and Authors' calculation.

suggesting that MDIs have transformed to a sustainability-oriented entities, with more emphasis on commercial funding sources such as deposits.

In addition, there are differences in the composition of assets between CBs and MDIs. CBs have high liquidity in their asset sides, which fluctuates from 35 to 50 percent over the period studied, while MDIs consistently keep liquidity assets of less than 20 percent over the period. Compared to MDIs, CBs seem risk-averse and tend to keep massive liquidity in their assets. There are a lot of possible causes for this high liquidity in CBs, such as the absence of deposit insurance. However, it might also be because dollarization incurs additional risks

on the operation of banks, as Deléchat et al. (2012) show through cross-country evidence. Since the lenders of last resort are unlikely to work under the dollarized economy, banks have to prepare for the entire of liquidity shocks on their own. In addition, the low liquidity of MDIs might imply that MDIs are likely to take a risk when extending loans, as their goals are rather to extend loans to the poor, who are typically risky borrowers for banks because of large information asymmetry.

3.2. History of Financial Dollarization in Cambodia

When the civil war ended with the Khmer Rouge taking office in April 1975, the Khmer Rouge regime introduced an extreme revolutionary program. It included bans on banking and even on money, including the local currency. The central bank was closed and the financial infrastructure was completely destroyed. Once the Khmer Rouge regime was ended in 1979, the central bank was reestablished, and in March 1980, the local currency, KHR, was reintroduced.

Since the reestablishment of the NBC, the banking system had been a mono-banking system, that is, a state-owned mono-bank with central, commercial, and development banking roles. The Foreign Trade Bank was established simultaneously inside the NBC to provide commercial banking services. USD started to flow into the country in the mid-1980, as the United Nations (UN) dispatched humanitarian and emergency aid, international non-governmental organizations (NGOs) were allowed to operate, and remittances from abroad resumed. During the 1980s, the country achieved only limited monetization and most domestic transactions were based on barter, with gold being the universal commodity for transacting and hoarding (De Zamaroczy and Sa 2002).

From 1989, the country started to seek the two-tier banking system, which was a gradual reform to separate the commercial banking function from the NBC. Nonetheless, lack of confidence in local currency, hyperinflation, and mas-

sive exchange rate devaluation of KHR against USD during 1988–1991 occurred and discouraged the public from holding their KHR-denominated assets (Pum and Vanak 2010).

The use of USD was further facilitated by large inflows during the operation of the United Nations Transitional Authority in Cambodia (UNTAC). During 1991–92, UNTAC brought US$1.7 billion, equivalent to about 75 percent of GDP at that time, mostly spent for rent and local services for its peacekeeping operation (De Zamaroczy and Sa 2002; Hill and Menon, 2014; World Bank, 2015). FX deposits became an important component for the bank deposit base (Rumbaugh et al., 2000). Under the two-tier banking system, the first privately owned commercial bank, Cambodian Commercial Bank, was established as a joint venture between Siam Commercial Bank and the NBC in July 1991 to attract investors and serve the activities of UNTAC (Pum and Vanak 2010).

Figure 2: The Exchange Rate and Dollarization
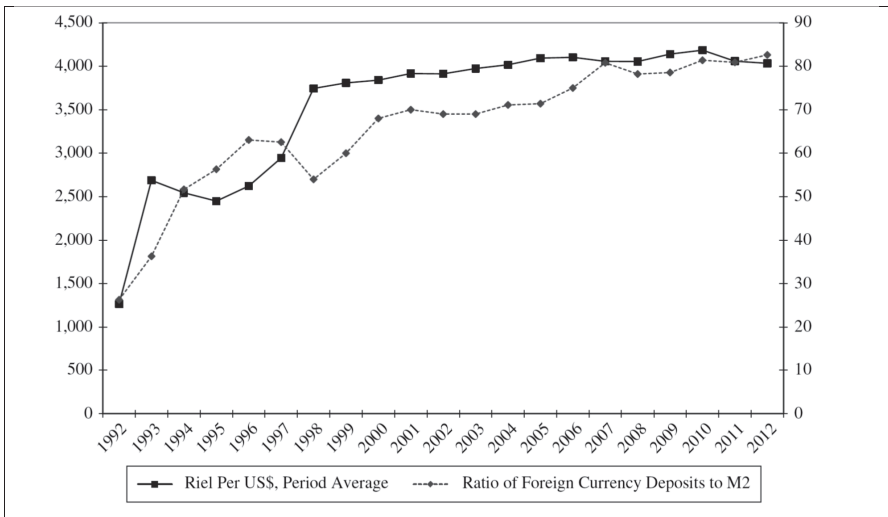
Source: Hill and Menon (2014)

### 3.3 The Current Financial Dollarization in Cambodia

Since then, dollarization has been prevailed in the Cambodian economy until now (Figure 3) As seen in Figure 10, the extent of dollarization has been persistently high, and the ratio of FX deposits to M2 has fluctuated at 85 percent in a decade. This figure is exceptionally high among Asian countries. Catão and Terrones (2016) showed that the Asian countries have a low dollarization on average compared to Europe and Latin countries (Figure 3). In that prior study, Asian regions have median of around 10 percent of the dollarization ratios or lower. In the meantime, the dollarization of Cambodia is recently 80 percent

Recently, there are two recent initiatives to developing the financial market of Cambodia, which is also aimed at facilitating local currency. One is the establishment of a stock exchange market, and another is the introduction of Negotiable Certificates of Deposit (NCDs). As for security exchange, the market began trading with one listing in April 2012. Listing is only allowed in KHR, but transactions can be made in either KHR or USD. To make any settlements in USD, the buyer and seller must have an agreement as to the exchange rate to be used; otherwise, the settlement must be done in KHR. As of the end of 2015, only three companies are listed, and traded volume is quite low. NCDs were introduced in September 2015 to promote the development of a money market and inter-bank lending on a secured base (securities can be used as collateral for repo-transactions). NCDs are currency-neutral, and can be issued in either KHR or USD.

According to Duma (2011), Cambodia economy has two parallel worlds: One is a USD-based urban economy comprising a flourishing garment sector, tourism, construction, foreign direct investment, and aid. The other is a generally KHR-based rural economy that is dependent on agriculture. Although the garment and services sectors, including tourism, are driving the economic growth, the exports base remains narrow and backward linkages of the manufacturing and service sectors to the rural economy are very limited. Moreover, the bank-

ing system is heavily concentrated in urban areas but is lacking an efficient network between the urban and rural branches. This concentration and fragmentation of the system imposes risks to economic stability (Duma 2011). In this regard, Odajima (2016) empirically show the consistent results to Duma's anecdotal evidence using the micro-data from a household survey. The author showed that Cambodian households in rural areas have a larger share of KHR in their currency composition of income, and expenditure, than those in urban areas, especially Phnom Penh. Aiba (2016a) empirically investigated the dollarization in Cambodian enterprises using data from a survey conducted in the same period as Odajima (2016). He shows that the dollarization in enterprise

Figure 3: Deposit Dollarization by regions
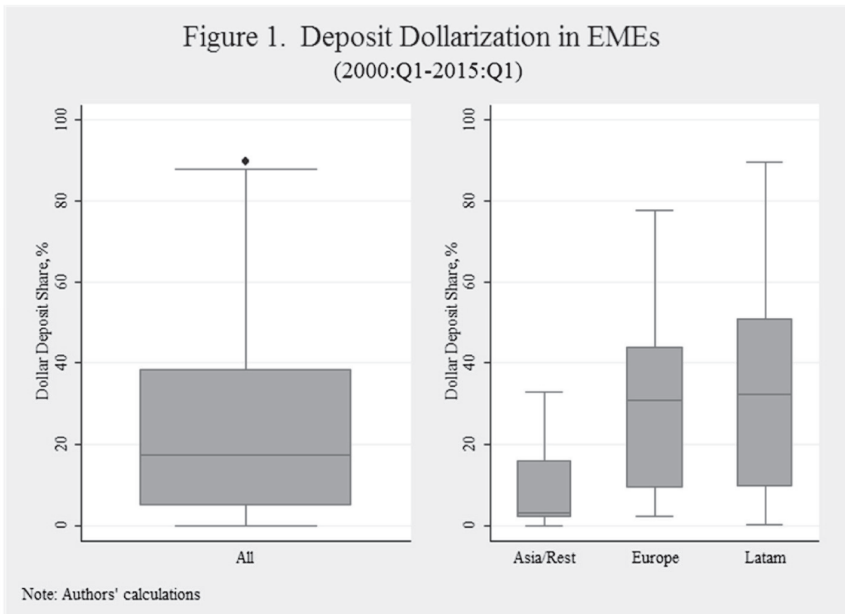
Source: Catão and Terrones (2016)
Note: The figure shows box charts of the ratio of FX deposits to total deposits.

sector is higher than households, and the extent of dollarization is different across industries, across regions, and across sizes of firms.

Previous studies have argued that the recent dollarization in Cambodia is not explained by currency substitution, since local currency deposits have been growing at the same pace as foreign currency deposits (Menon, 2008; Duma, 2011; Khou, 2012). This is currently still the case. The amounts and year-on-year growth rates of aggregated bank deposits by currencies are shown in Figure 4. Panel C reveals that the local currency deposits have been increasing rapidly along with foreign currency deposits, although the growth rates of local currency deposits are much more volatile than foreign currency deposits. Therefore, the current expansion of dollarization is not the consequence of distrust in the local currency, but is instead caused by the massive inflow of foreign currency.

4. Survey Design and Data Description

To understand the behavior of economic agents (CBs and MDIs) in a dollarized market, we conducted a survey to collect financial statements both at the bank-level and at the branch-level in selected CBs and MDIs. We conducted a survey of 10 CBs and 5 MDIs in April, 2015. Since it was difficult to collect data

Figure 4: Amounts and Growth of Deposits by Currencies
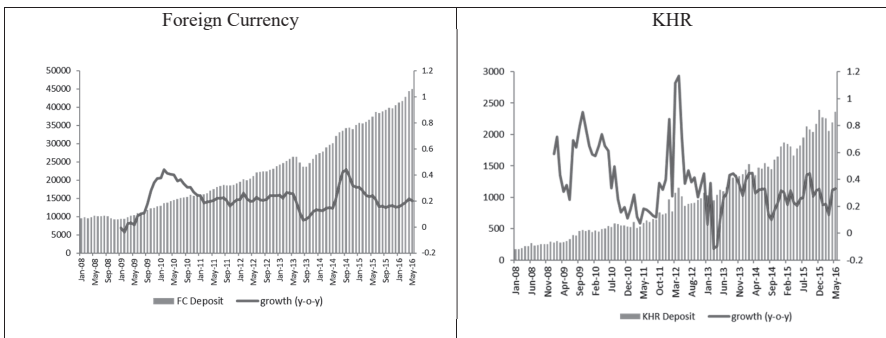
Source: Data provided by National Bank of Cambodia, and Authors' calculation.

from all extant CBs and MDIs in Cambodia due to the limitations on our re-
sources for the survey, we selected the top 10 CBs and 5 MDIs in terms of both
asset sizes and the number of branches. The managers of banks filled out and
submitted two types of data entry formats: (1) consolidated financial statements,
and (2) branch-level financial statements from the period from 2009 to 2013.
Both types of data cover information of currencies in most of items of income
statements and balance sheets.[2]

4.1 Consolidate Balance sheet

　We collected the consolidated financial statements from 10 CBs and 5 MDIs.
However, some banks did not provide us with consolidated financial statements.
Eventually, there were statements from 7 CBs and 4 MDIs from 2009 to 2013
available to analyze their behaviors in FX currency lending and collecting FX
currency deposits. We present the final sample used for our analysis in Table 1.

4.2 Branch-level Balance sheet

　In addition to the consolidated financial statements at the bank-level and
MDI-levels, we also collected branch-level financial statements from branch-
es of banks. We prepared the same format for all financial institutions sur-
veyed in our project, and asked the same 10 CBs and 5 MDIs to fill out our
branch-level financial statements. Although some banks provided us data of all
of their branches, others only provided us with data from selected branches be-
cause of data availability.[3] We found that there were some errors in reported
branch-level financial statements, possibly because the forms of financial state-
ments used in their operations are different from a bank to a bank. To analyze

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2) The entry form of bank- and branch-level financial data used in the survey is available
　upon request.
3) Some of banks categorize their branch network into several levels, and they aggregated
　financial records for branches below a certain level.

Table 1: Final Sample of consolidated financial statements

Name		Period of observations
ACLEDA Bank Plc	Acleda	2009-2013
ANZ Royal Bank (Cambodia) Ltd	ANZ	2009-2013
Advanced Bank of Asia Limited	ABA	N.A.
Bank for Investment and Development of	BIDC	2009-2013
Cambodia Public Bank	Campu	N.A.
Canadia Bank Plc	Canadia	2009-2013
Foreign Trade Bank of Cambodia	FTB	2009-2013
Maybank (Cambodia) Plc	Maybank	2009-2013
RHB Indochina Bank Limited	RHB	N.A.
Union Commercial Bank Plc	UCB	2009-2013
Amret (Micro finance)	Amret	N.A.
AMK (Micro finance)	AMK	2009-2013
HATHA KAKSEKAR Limited (Micro finance)	HKL	2009-2013
PRASAC Microfinance Institution (Micro finance)	PRASAC	2009-2013
SATHAPANA Limited (Micro finance)	SATHAPANA	2009-2013

the banks' behaviors in lending and collecting deposits at the branch level, we selected samples that correctly reported at least the amounts of loans and deposits.

There are several cautions relating to sample selection biases. Firstly, we lack headquarters' financial statement, since headquarters only reported the consolidated financial statements at the bank-level. Secondly, we excluded several banks due to frequent errors and missing values. For example, since there were a lot of errors and missing values in the loan and deposit data of Canadia bank, we excluded Canadia bank. Likewise, we excluded ABA from our analysis of loan currencies since only 2 percent of ABA branches reported the currency composition of loans.[4] Since UCB only provided us with data for the consolidat-

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4)　We retained ABA in the analysis on deposits.

ed financial statements of all branches, we also excluded UCB. Thirdly, we excluded some branches that reported no loans or no deposits. Table 2 shows the final sample which we used in the analysis of bank loans, and Table 3 shows the final samples for deposits.[5] Finally, since we did not collect the financial statements from all branches, the results of branch-level analyses could be different

Table 2: Sample size for Analysis on Loans by Areas

	Phnom Penh	Siem Reap	North-west Area	North-East Area	Central Area	South-West Area	South-East Area	Total
ACLEDA	64	24	22	15	91	41	70	327
ANZ	0	5	0	0	5	5	0	15
BIDC	0	4	0	0	3	0	0	7
Campu	45	5	5	0	10	13	9	87
FTB	5	0	0	0	0	4	0	9
Maybank	37	5	1	0	3	7	0	53
RHB	21	4	0	0	4	6	0	35
AMK	10	5	15	20	31	16	25	122
AMRET	12	5	3	1	59	9	53	142
HKL	10	14	23	3	42	19	36	147
PRASAC	12	8	20	16	61	36	57	210
SATHAPANA	13	10	5	7	53	17	30	135
Total	229	89	94	62	362	173	280	1,289

Note: This table shows the number of branches of each bank used in analysis during the period from 2009-2013. Since there were a lot of errors in loan and deposit data from Canadia bank, we excluded Canadia bank. Since UCB only provided us with data from the headquarters, we also excluded UCB. Because some banks did not provide headquarters' data, we only included branches.

5）　The sample sizes are shown by regions. In the analysis section, we investigate the regional difference of dollarization, and we divided the sample by regions. For the sake of simplicity, we categorized samples into 7 regions according to the geographical characteristics and types of main economic activities. We cattegorized 25 provinces into 7 regions as follow: (1) the Phnom Penh are; (2) the Siem reap area; (3) the Northeast Area, which includes Kratie, Modul Kiri, Ratanak Kiri, and Stung Treng; (4) the Northwest Area, which includes Banteay Meanchey, Otdar Meanchey, and Preah Vihear; (5) the Central Area, which includes Kampong Cham, Kampong Chhnang, Kampong Speu, Kampong Thom, and Kandal; (6) the Southeast Area, which includes Kampot, Kep, Prey Veng, Svay Rieng, Takeo, and Tboung Khmum; (7) the Southwest Area, which includes Koh Kong, Preah Sihanouk, Pursat, Battambang and Pailin.

Table 3: Sample size for Analysis on Deposits by Areas

	Phnom Penh	Siem Reap	North-west Area	North-East Area	Central Area	South-West Area	South-East Area	Total
ACLEDA	64	24	22	15	91	41	70	327
ANZ	0	5	0	0	5	5	0	15
ABA	29	5	0	0	5	6	1	46
BIDC	0	4	0	0	0	0	0	4
Campu	46	5	5	0	10	13	9	88
FTB	5	0	0	0	0	4	0	9
Maybank	41	5	1	0	3	9	0	59
RHB	25	4	0	0	4	8	0	41
AMK	10	5	15	20	31	16	25	122
AMRET	12	5	3	1	59	9	53	142
HKL	10	14	23	3	42	19	36	147
PRASAC	13	8	20	16	64	36	57	214
SATHAPANA	13	10	5	7	53	17	29	134
Total	268	94	94	62	367	183	280	1348

Note: This table shows the number of branches of each bank used in analysis during the pe-
riod from 2009-2013. Since there were a lot of errors in loan and deposit data from Ca-
nadia bank, we excluded Canadia bank. Since UCB only provided us with data from the
headquarters, we also excluded UBC. Because some banks did not provide headquar-
ters' data, we only included branches.

from the results of analysis on the consolidated financial statements. However,
we expect that the branch-level analysis will not produce huge differences,
since we collected a large sample of branch-level financial statements.

In Table 4 and 5, we also present the sample sizes by years, and the number
of all the branches in 2013. In total, the number of samples in our sample covers
about 34% (323 branches out of 954 of total branches) for analysis on loans, and
about 35% (338 branches out of 979 of total branches) for analysis on deposits.
Although the coverage of Acleda's and MDIs' branches seems low despite the
large number of their branches, most of their branches are liaison office and do
not keep the financial statements (NBC, 2007).[6]

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6)　Acleda has a large number of liaison offices, since it was formerly a microfinance
institution, and it still provide microfinance loans.

Table 4: The sample sizes by years for loan analysis

	2009	2010	2011	2012	2013	Total	Number of All branches in 2013
ACLEDA	60	62	62	71	72	327	238
ANZ	3	3	3	3	3	15	17
BIDC	0	1	2	2	2	7	7
Campu	14	17	18	18	20	87	26
FTB	1	2	2	2	2	9	6
Maybank	6	9	11	11	16	53	16
RHB	1	7	9	9	9	35	9
AMK	23	23	23	25	28	122	128
AMRET	18	22	29	33	40	142	87
HKL	17	26	33	35	36	147	136
PRASAC	0	45	49	54	62	210	173
SATHAPANA	19	22	29	32	33	135	111
Total	162	239	270	295	323	1,289	954

Note: For NBC (2014) provides the number of all the branches of commercial banks. For MDIs, we obtained data from the website of Cambodia Microfinance Association.

Table 5: The sample sizes by years for deposit analysis

	2009	2010	2011	2012	2013	Total	Number of All branches in 2013
ACLEDA	60	62	62	71	72	327	238
ANZ	3	3	3	3	3	15	17
ABA	7	7	8	9	15	46	25
BIDC	0	1	1	1	1	4	7
Campu	14	17	18	19	20	88	26
FTB	1	2	2	2	2	9	6
Maybank	9	10	12	12	16	59	16
RHB	5	9	9	9	9	41	9
AMK	23	23	23	25	28	122	128
AMRET	18	22	29	33	40	142	87
HKL	17	26	33	35	36	147	136
PRASAC	0	46	49	56	63	214	173
SATHAPANA	19	22	28	32	33	134	111
Total	176	250	277	307	338	1,348	979

Note: For NBC (2014) provides the number of all the branches of commercial banks. For MDIs, we obtained data from the website of Cambodia Microfinance Association.

5. Empirical Analysis

## 5.1 Trend of dollarization by types of financial institutions

First of all, using the consolidated financial statement by banks, we inves-
tigate the currency used in total loans, deposits, and borrowings by types of
financial institutions. Figure 3 shows the amounts of loans, deposits, and bor-
rowings by currencies. On the whole, we found that growth rates of deposits,
loans, and borrowings were high in total for both of CBs and MDI during the
time period. More specifically, we found that growth in loans, deposits, and bor-
rowings were higher in MDIs than CBs, showing the recent flourishing of the
Cambodian MFI sector. Meanwhile, the total amount of loans and deposits is
still much higher in CBs than in MDIs. In CBs, the growth of loans and deposits
was higher in FX currency than in local currency.

Figure 6 shows the currency composition of assets and liabilities. In addition
to loans, deposits, and borrowings, we collected information on cash holdings
and balances in other banks by currencies. On the whole, we find that MDIs
have more KHR currency in their balance sheets than CBs do. For example,
MDIs keep around 20 percent of total loans, deposits, and borrowings denomi-
nated in KHR as of 2013, while CBs kept less than 10 percent in KHR.

In line with the figures illustrated by aggregated data in section 3 (Figure 3),
despite the recent rapid growth in deposits, KHR deposits as a share of total
deposits have been stable both in CBs and MDIs. As we discussed earlier, this
suggests that demands for local currency deposits have also increased at the
same rate as FX currency deposits have in this period.

However, shares of FX currency in loans from MDIs fell from around 40
percent in 2009 to 20 percent in 2013, reaching almost the same level as shares
of FX currency in deposits and borrowings. It can be interpreted that MDIs
changed their attitude toward the risk of currency mismatch on their balance
sheets, and as a result, they started to decrease the risks by matching the com-
position of loans to those of deposits and borrowings.

**Figure 5: Changes in Currency Compositions and Amounts of Loans, Deposits, and Borrowings**
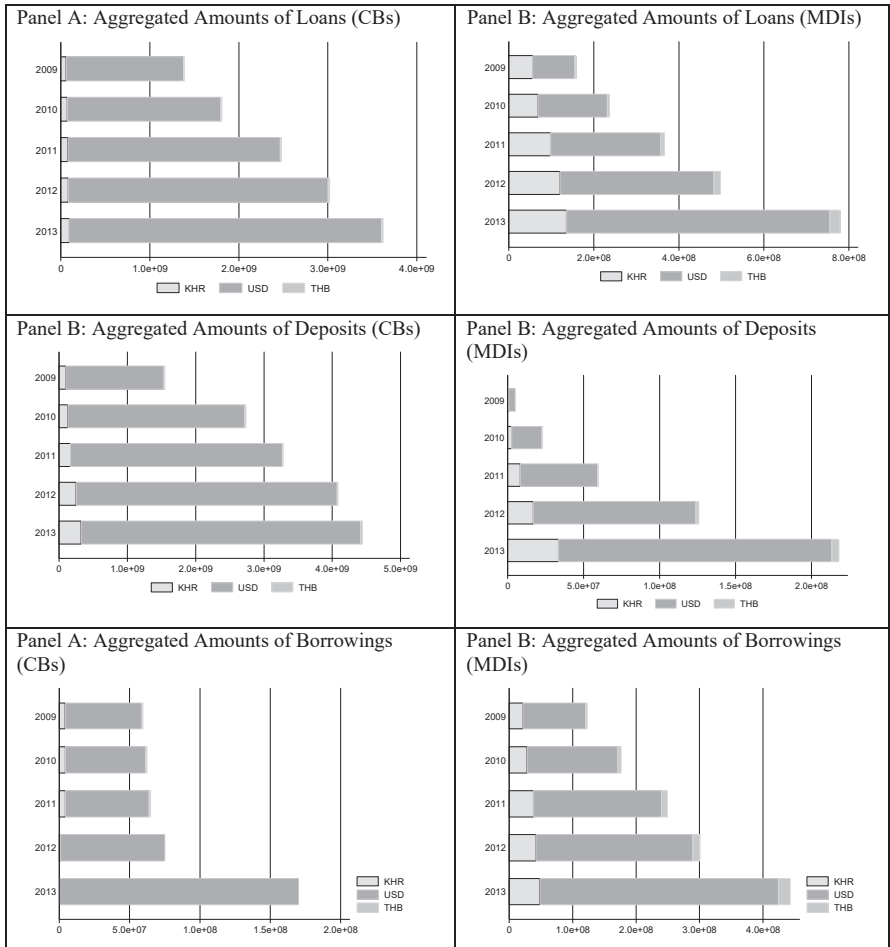
5.2 Branch-level Analysis on Financial Dollarization

5.2.1. Regional Differences and Bank Behaviors in Deposits and Loans

In this section, we analyze branch-level financial data to investigate the regional differences in the dollarization of CBs' and MDIs' deposits and loans.

Figure 6: Currency Compositions of Assets and Liabilities
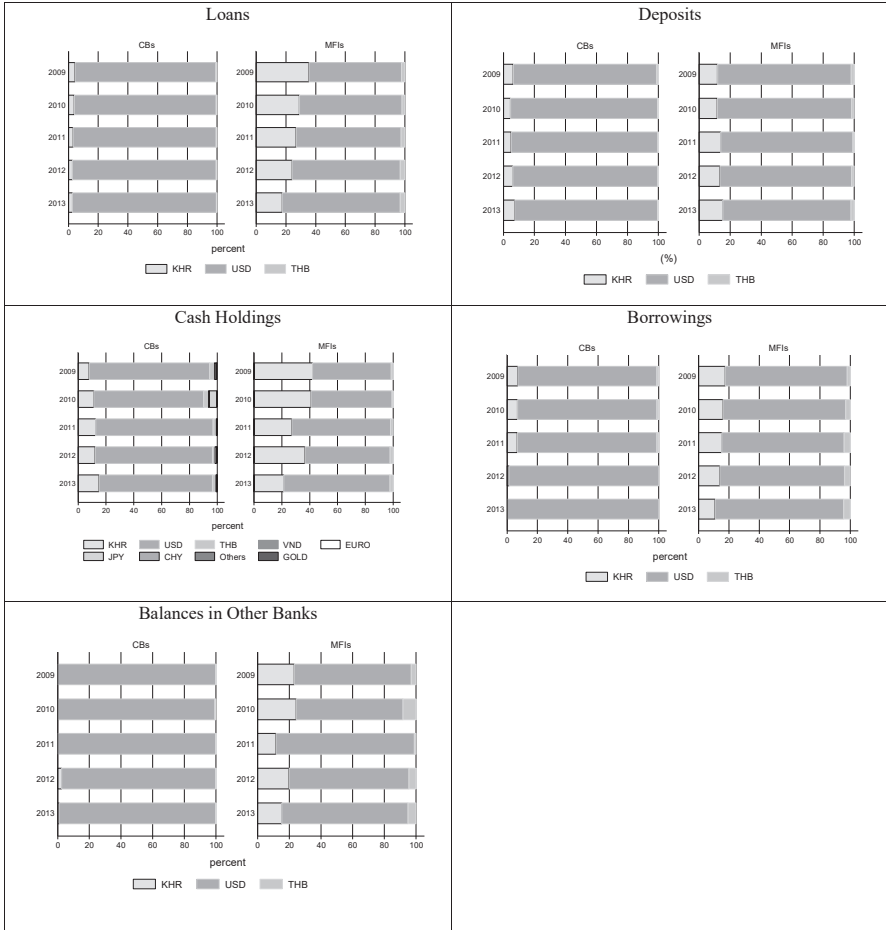
As argued by Duma (2011), there may be differences in industrial structures between urban and rural areas. The urban economy is expected to be US dollar-based; a lot of companies make profits from services relating to tourism, and there are massive capital inflows through foreign direct investments and aid. Furthermore, the garments sector flourishes in urban areas, contributing

through exports to the recent rapid growth. On the other hand, the rural areas, where the agricultural sector largely contributes to the regional growth, are expected to be a riel-based economy. Accordingly, there are possibly differences in the extent of dollarization between urban and rural areas.

First of all, it is useful to show the general trend of lending and deposits. Recent empirical studies found that nation-wide banks are likely to reallocate the funds over the country (Morgan et al., 2004; Imai and Takarabe, 2011; Cremer et al., 2011). We investigated how the Cambodian banks reallocate funds over the country. In Figure 7, we present the average of total amounts of loans and deposits per branch by regions. To investigate the regional difference in dollarization, we divided sample into seven regions: (1) Phnom Penh, (2) Siem Reap, (3) North-East Area, (4) North-West Area, (5) Central Area, (6) South-West Area, and (7) South-East Area.

Interestingly, we find that there was a clear tendency in fund allocations in both CBs and MDIs (Figure 7). We find that, in urban areas, the amounts of loans were smaller than those of deposits, while the opposite was true in rural areas. For example, the amounts of loans were smaller than that of deposits in Phnom Penh, while amounts of loans were larger than those of deposits in other areas. Although the difference in amounts between deposits and loans in the Phnom Penh area does not completely compensate for the total difference in other rural areas, the difference is partly due to the exclusion of the headquarters' financial data from the analysis. It suggests that banks collect funds mostly in urban areas, where wealthier people more likely live, and banks mobilize the rest of funds to rural areas, where firms are mostly small- and medium-sized and face shortages of funds. It may also imply that the investment opportunity is currently higher in rural areas than urban areas in Cambodia. Furthermore, it is noteworthy that the results seem specific to the Cambodian banking sector, compared to other neighboring countries. For example, in the Philippines, the financial institutions tend to collect funds in rural areas and extend loans mainly

in urban areas, due to the low business opportunities in rural areas.

Next, we looked into trends of loan provision and deposits by currencies. Panel C and Panel D of Figure 7 represent the amounts of loans and deposits per branch in each region by KHR and FX currencies. We find that distributions of USD loans and deposits per branch show the same trends as those of gross loans and deposits, while the distributions of KHR loans and deposits per branch show different results. This is particularly true for CBs, which collect KHR deposits in Phnom Penh, but don't allocate excess KHR funds to rural areas. Furthermore, in some areas, the amounts of KHR loans are less than the amounts of KHR deposits, and even though the amounts of KHR loans in other areas exceed the amounts of KHR deposits, the differences are small. The re-

Figure 7: Trends of Loans and Deposits
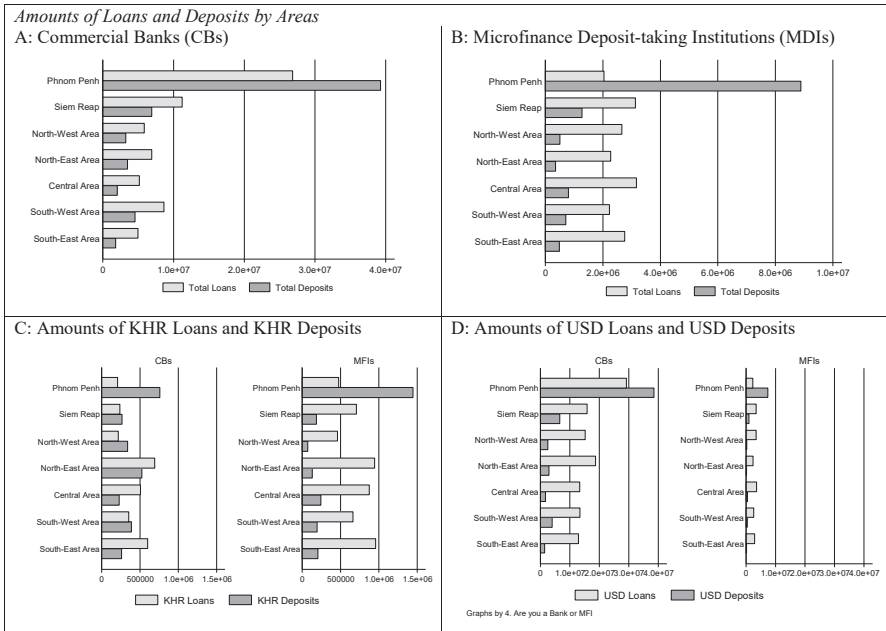
Note: figures show the average amounts of loans and deposits per branches by regions, as of 2013. We calculated the averages by types of financial institutions: CBs and MDIs.

sults suggest that CBs are not active in providing KHR loans, and they do not internally allocate the excess KHR funds to rural areas. In the meantime, the amounts of KHR loans from MDIs are more than amounts of KHR deposits, and the difference between the amounts of loans and deposits are large. Thus, the results suggest that MDIs actively collect KHR funds in developed areas, and allocate those funds to rural areas.

Next, we investigate the distribution of shares of FX currency in deposits and loans by areas (Figure 8). We find that the distributions of FX currency shares are biased and concentrated on 100 percent both in deposits and loans, suggesting that most branches mainly deal with FX currencies rather than the local currency (Panel A and Panel B). However, it can be observed that the distribution of FX currency shares in loans also concentrated around 0 percent, suggesting that some branches extended loans largely in the local currency (Panel A), while it cannot be observed in deposits. Therefore, even though the Cambodian banking sector is highly dollarized when looking at the aggregated measure, such as the ratio of FCD to M2 and the ratio of FCD to total deposits, some branches of Cambodian banks mainly extend local currency loans. The difference in the shape of distribution between loans and deposits might be explained by the fact that in the rural areas most of MDIs aims to extend loans rather than collect deposits. In other words, as well as CBs, MDIs tend to collect deposits in urban areas.

In Panel C and Panel D, we further investigated the geographical differences in deposit and loan dollarization by regions. We divided the sample into seven regions according to geographical location and main economic activities. We find that there were differences in the shape of distributions between regions. Although statistical significance is not clear here, the distributions of the FX currency share both in loans and deposits in the Phnom Penh area seems to concentrate around 100 percent, while in the other areas the distributions are more flat both in deposits and loans, and there is also the concentration around

0 percent. The results might imply that there are high KHR demands in rural areas relative to the Phnom Penh area.

In Figure 9, we present the historical changes in regional dollarization in deposits and loans between 2010 and 2013 by types of banks. The small circles represent the ratios of FX currency in total deposits per branch in 2010, and the head of the arrows represent those in 2013. We find that the recent changes in the shares of FX currency in deposits and loans differed between CBs and MDIs, especially on the deposit side. For CBs, shares of FX currency in both deposits and loans have increased from 2010 to 2013. It might suggest that, for CBs, dollarization in deposits and loans have constantly increased both in rural and urban areas. In the meantime, for MDIs, shares of FX currency in deposits

Figure 8: Distributions of Ratio of FX currency in Loans and Deposits
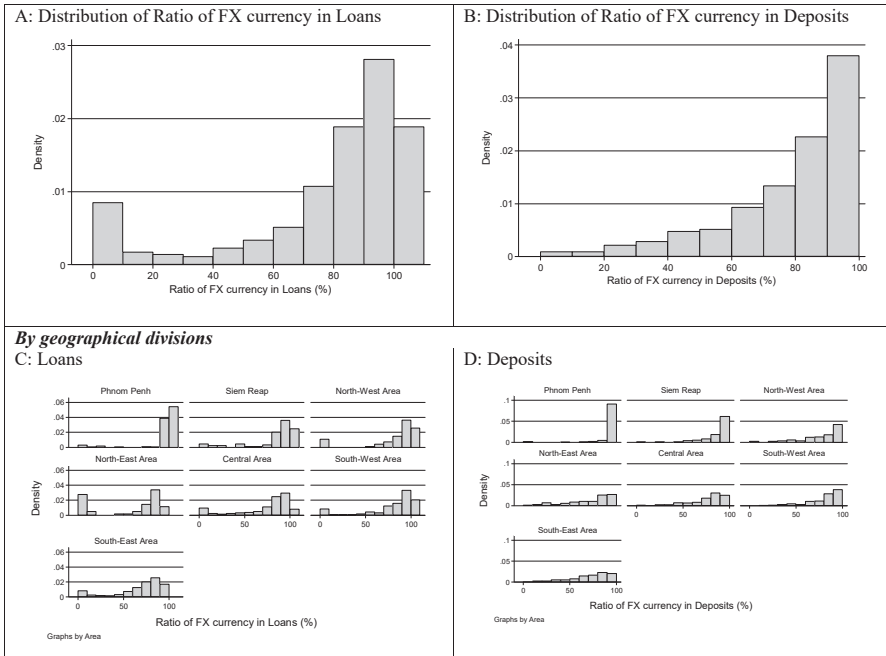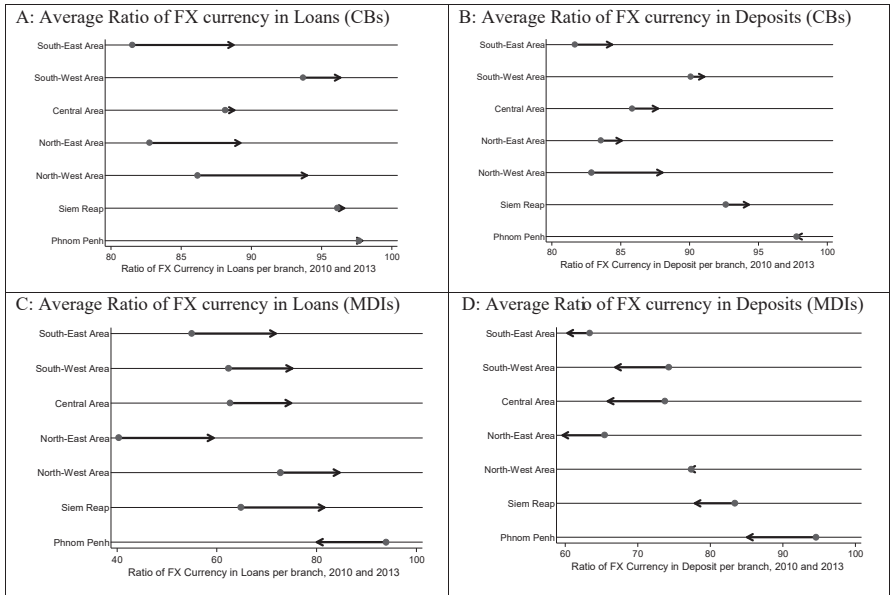
Figure 9: Trend of Dollarization in 2010 and 2013

Note: Figures below show the changes in shares of FX currency between 2010 and 2013. The
small circles represent the ratios of FX currency in total deposits per branch in 2010,
and the heads of arrows represent those in 2013.

have decreased, while those of loans have steadily increased as loan shares of
CBs have.

　The results depicted in Figure 9 may reflect the recent commercialization
of MDIs. As was discussed in an earlier section, in recent years MDIs started
to collect deposits from the public, and have developed a nationwide network
in Cambodia. Therefore, increases in financial inclusion might facilitate local
currency deposits in rural areas. In other words, people in rural areas, who did
not have access to bank deposits due to their geographic distance from banks,
might have gained access to bank deposits in recent years.

　However, the shares of FX currency in MDIs' loans have increased except
for in Phnom Penh. This might suggest that commercialization has a negative

impact on local currency loans, in contrast to deposits. The dollarization of deposits has increased its share of total MDIs' deposits as we have already seen, even though local currency loans by MDIs have increased in rural areas. Finally, the Cambodian financial institutions may reallocate excess funds from urban areas to rural areas.

5.2.2 Currency Compositions of Revenues and Expenditures

We investigated the currency composition of revenues and expenditures using branch-level income statements from CBs and MDIs. Although currency compositions of interest incomes are proportionate to the currency composition of loans, revenues of banks include non-interest income, such as commission fees and profits from exchange rate business. Expenditures also include the personnel or other operational costs, apart from interest expenses on deposits. Therefore, the currency usage of revenues and expenditures could show different figures from what was revealed by the balance sheet data. In Figure 10, we present a ratio of FX currency generated on the income statement.

Figure 10 shows the distributions of ratios of FX currency in revenues and expenditures of branches in the observed period from 2009 to 2013. In panel A of Figure 10, the distributions of ratios of FX income concentrated at 100 per-

Figure 10: Distribution of ratio of FX currency in income
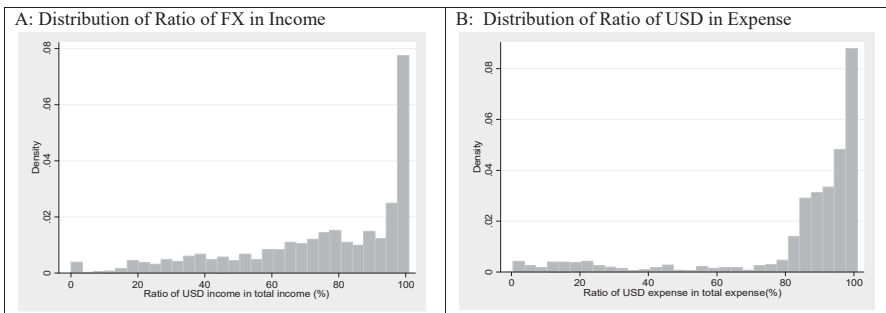
cent, in line with the results of analysis on balance sheets. The distributions of ratios of FX expenditures concentrated on the right-hand side, reflecting that they spent mostly in FX currency.

We further investigated revenues and expenditures from various aspects. Figures 11 and 12 show the distributions of the ratios of FX currency by areas, years, and types of financial institutions. When the distribution was divided by areas, most of the ratio of FX revenues concentrated on the right-hand side, in particular in Phnom Penh and Siem Reap, while the distributions are lower and flat in other areas, especially in the Southeast Area (Panel B). Furthermore, we found that CBs tended to generate more income in FX than MDIs (Panel C and Panel D of Figure 11).

Figure 13 presents the average currency compositions in revenues and expenditures per branch. Panel A and Panel B show the historical changes in currency compositions of CBs and MDIs. It was revealed that Cambodian financial

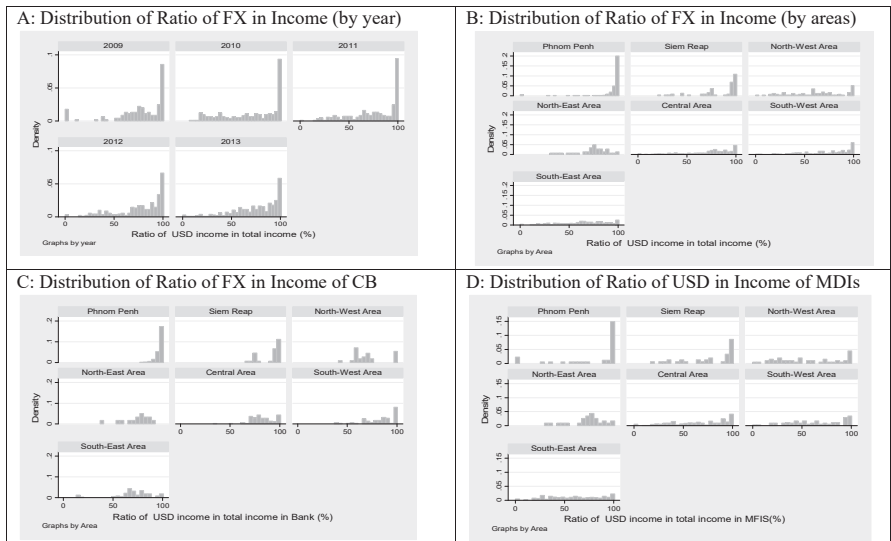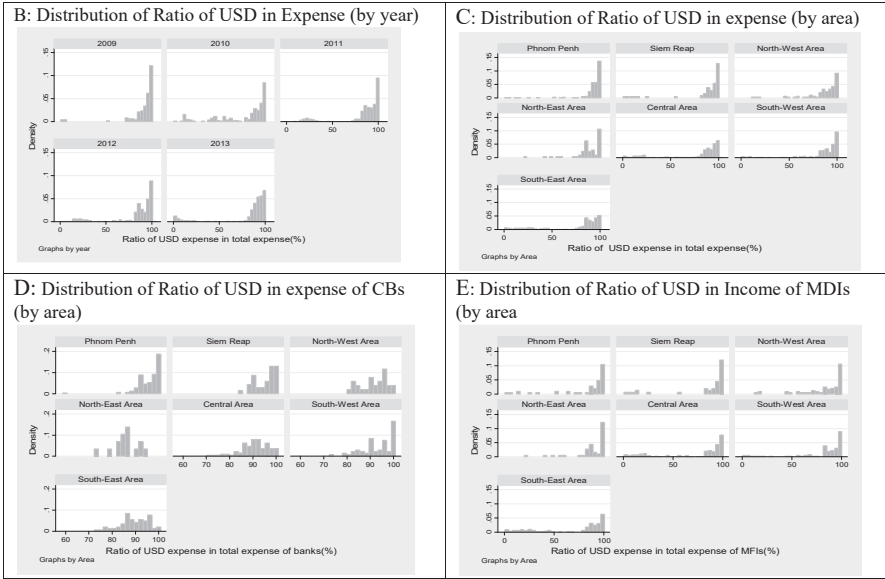## Figure 11: Distribution of ratio of FX currency in income

Figure 12: Distribution of ratio of FX currency in expenditure

institutions were likely to spend more in FX than they generated (Panel A and Panel B).

Panel C and Panel D of Figure 13 show the geographical differences in currency composition of revenues and expenditures. Phnom Penh shows high dollarization, while the South-East Area shows a lower level of dollarization in their revenues and expenditures. Interestingly, we found that branches in the North-West and South-West Areas generated income in the local currency THB, and VND. Also of interest, CB branches in the North-East and South-East Areas generated more income in KHR compared to other areas.

We next investigated the differences in currency compositions of revenues and expenditures per branch between CBs and MDIs. Figure 14 shows the results for CBs and Figure 12 for MDIs. In Panel A and Panel B, we found that there was a clear trend in the historical changes of currency compositions of

## Figure 13: Currency composition of income and expenditure

revenues and expenditures. KHR shares in revenues and expenditures have de-creased over the observed period. Panel C and Panel D of Figure 14 depict the currency compositions of aggregated income of CBs and confirm that CBs have increased their income in USD and are highly dollarized in Phnom Penh and Siem Reap.

Figure 15 shows currency composition in aggregate revenues and expendi-tures of MDIs. The result showed that 30 to 40 percent of income is generated in KHR, especially in the South-East Area. It revealed that MDIs rely more on KHR in their operations. In contrast to CBs, there are no clear trends in the his-torical changes of average currency composition of revenues and expenditures for MDIs. In 2010, the ratios of KHR currency were high, while they were low in the other periods.

Similar to CBs, MDI branches in the North-West and South-West Areas gen-

Figure 14: Currency composition of income and expenditure of CBs
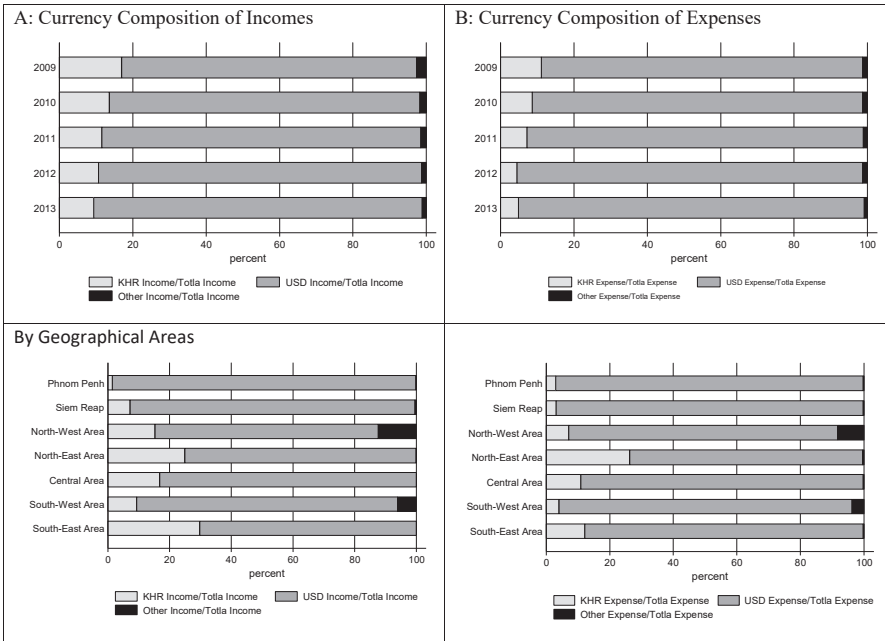
erated revenues in other currencies, such as THB or VND (Panel A). On the whole, the expenditure sides are more dollarized than the revenue sides in both CBs.

6. Conclusion and Policy Implications

The dollarization of the Cambodian financial sector has been referred to as extreme, with about 95 percent of foreign currency deposits (loans) in total deposits (loans) in the entire banking sector, and 85 percent of foreign currency deposits to M2 as of 2013. Although there have been several previous studies which investigated dollarization and which argued the advantages and disadvantages of the dollarization in Cambodia, there have been no studies that employed individual-bank-level data of currency composition. As a result, the

Figure 15: Currency composition of income and expenditure of MDIs
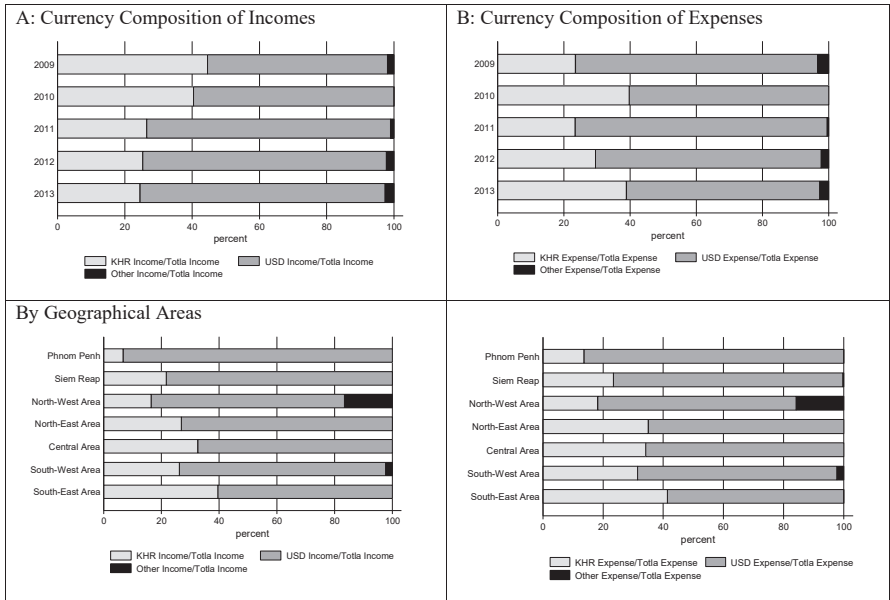
actual situation across sectors and regions has been unclear. As the previous literature points out, there might be heterogeneity in banks' behaviors, and also differences in economic activities among regions.

　The key to better understanding of dollarization is to collect comprehensive data on a sector basis. In order to develop our understanding of the Cambodian dollarization, we conducted a survey of financial institutions in Cambodia. In the survey, we collected financial data from branches of financial institutions, which allowed us to ascertain the exact amounts of financial assets and debts by currency in the financial institutions both at bank- and branch-levels. We collected unique data from 15 financial institutions spanning the period from 2009-2013. Our study is the first study to reveal the actual situation of Cambodian financial dollarization. We believe that our findings can be useful for making policies to achieve de-dollarization, and the stabilization and facili-

tation of financial development.

Our main findings are as follows. First, we found that CBs rely much more on FX currencies in their operations than MDIs do. However, the shares of the local currency in deposits have been stable in the period from 2009 to 2013, despite recent rapid growth in the amounts of total deposits. Second, we found that financial institutions were likely to allocate excess funds (deposit amounts minus loan amounts) to branches which were short of funds. Meanwhile, commercial banks did not actively allocate KHR funds, although they had a large excess of KHR funds in Phnom Penh. Third, in rural areas, shares of FX currency in loans and deposits were lower than in Phnom Penh, although there were indications that shares of FX currency in loans have been increasing in rural areas in the period. Forth, shares of FX currency in MDI deposits have decreased in both rural and urban areas. It might be because recent improvements in financial inclusion have allowed people in rural areas, who mainly use KHR in their daily transactions, to have access to bank deposits.

These findings can lead to several important implications for policy-making regarding de-dollarization and financial development. Firstly, the government should facilitate the allocation of KHR funds for commercial banks (CBs), to promote KHR loan provisions. We found that financial institutions have larger amounts of deposits than loans in Phnom Penh, and smaller amounts of deposits than loans in other areas, reflecting that financial institutions collect funds in developed areas and allocate excess funds to rural areas. However, we found that, even though they have excess KHR deposits in Phnom Penh, the amounts of KHR deposits are larger than or the same as KHR loans in rural areas for CBs. This suggests that CBs are not actively engaged in the fund allocation of KHR. In the meantime, MDIs are actively engaged in both KHR and FX fund allocation across the country. For some reason, CBs are reluctant to extend excess KHR funds from urban areas to rural areas. Since KHR is commonly used especially in rural areas, and there seems high demand for KHR, it is effective

to promote KHR loans by facilitating the transfer of excess KHR funds from urban areas to rural areas.

　Secondly, financial inclusion may also help promote KHR deposits. In line with recent arguments by Menon (2008) and Duma (2011), local currency deposits have increased at the same pace as FX deposits, while the growth of local currency deposits is higher in rural areas, and KHR loans and deposits are more common in rural areas. Especially for MDIs, the ratio of KHR deposits have increased across the regions over the period, probably because their branch network penetrated even in rural areas, and recent progress in financial inclusion allowed the poor to access deposits. Therefore, in order to achieve de-dollarization via market mechanisms, facilitating the fund collection of financial institutions in rural areas can be a feasible strategy, which would likely lead to an increase in the KHR shares in deposits and facilitate the provision of local currency loans. For example, by facilitating financial institutions to expand their branch networks, the government can promote the provision of deposit services to rural areas, which may increase KHR deposits.

　Thirdly, introducing hedging instruments against the currency mismatch risks for CBs and MDIs is required to help stop the recent rapid increase in the provision of FX loans. Even though the shares of KHR deposits in total deposits has been increasing rapidly over the period, the provisions of FX loans and the shares of FX loans in total loans have risen in CBs and MDIs. In particular, the increase in shares of FX loans are notable in MDIs. This might reflect that MDIs became risk-averse after starting to collect commercial funding sources, and have been trying to reduce the risks of currency mismatch by increasing shares of FX currency in loans to the shares of FX currency in deposits. As of 2009, shares of KHR in MDI loans exceeded the shares of FX currency in MDI deposits and borrowings, and afterward the gap between shares of KHR of MDI loans and MDI deposits has decreased over the period (Figure 6). This might imply that MDIs tended to extend KHR loans in response to the local

demand for KHR loans. However, it is a natural response for risk-averse MDIs to reduce currency mismatch risks against the large shares of FX deposits because they need to improve the resilience after they started to collect deposits from the public. Accordingly, it is expected that MDIs will continue to increase the provision of FX loans over the next few years at the same pace, although it may have a positive effect on resilience of bank managements. Thus, if policy measures are to be taken to reduce FX loans, some financial instruments would be required to offset the currency mismatch risks on MDIs' balance sheets. Given the large branch networks of MDIs and the recent expansion of the entire microfinance sector, the MDIs can be the good drivers to promote the local currency loans and deposits to rural areas.

However, there are limitations on our study. In the data we used, there are errors in deposits and loans which possibly stem from the data collection process. Since the format to collect data was different across some of CBs and MDIs, some financial institutions failed to complete filling out the format correctly. Our sample of financial institutions was reduced to 11 for consolidated financial statements and 12 for branch-level financial statements. In the future study, collecting data from more financial institutions and increasing the quality of data by reducing errors will be required for better understanding of dollarization.

Moreover, investigating a causal relationship of financial dollarization is still one of the main challenges of our study. Whether regional demand or banks drive FX currency deposits/loans is still unclear, and the results could be a mixture of both effects. Further investigation is also needed into the determinants of the growth of local currency deposits and loans using econometric models.

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