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Deposit Dollarization and Financial Inclusion: Evidence from a Household Survey in Cambodia

Daiju Aiba*†and Sam Vichet‡

Abstract

Deposit dollarization has long prevailed in developing countries. This paper investigates factors behind household saving behavior in local and foreign currency, respectively, using a nationally representative household survey carried out by the National Bank of Cambodia (NBC) and the JICA Research Institute (JICA RI) in 2017. We empirically assess whether the portfolio selection model, which is frequently used for the explanation of financial dollarization, fits the data from Cambodian households. To test the hypothesis, we develop an empirical approach for currency choice of deposit account by taking into account an important aspect of dollarization; the correlation between choice of foreign currency deposits and financial access for Cambodian households. As a result, we find that portfolio selection models play marginal roles in deposit currency choices in Cambodia. We also find that currency choice of deposits is still to some extent affected by a household's expectations of inflation rates and exchange rates, and the appreciation of the local currency. For example, a stable inflation rate would facilitate having local currency deposits. In addition, we find that an increase in income level is associated with an increase in both having local currency and foreign currency deposits, while the marginal effects of an increase in income are larger on having local currency deposits for lower-income households and for households in rural areas. The results suggest that financial inclusion by facilitating economic development in rural areas will foster the promotion of local currency. We further find that, in contrast to previous findings from Central and Eastern European countries, younger cohorts are less likely to have local currency deposits than older cohorts. Hence, policies aiming at reducing real dollarization and promoting the awareness of young people towards the importance of using national currency are necessary.

Key words: Dollarization, Financial access, Foreign currency deposits, Household behaviors, Bivariate Probit model.

JEL codes: D14, G11, G21

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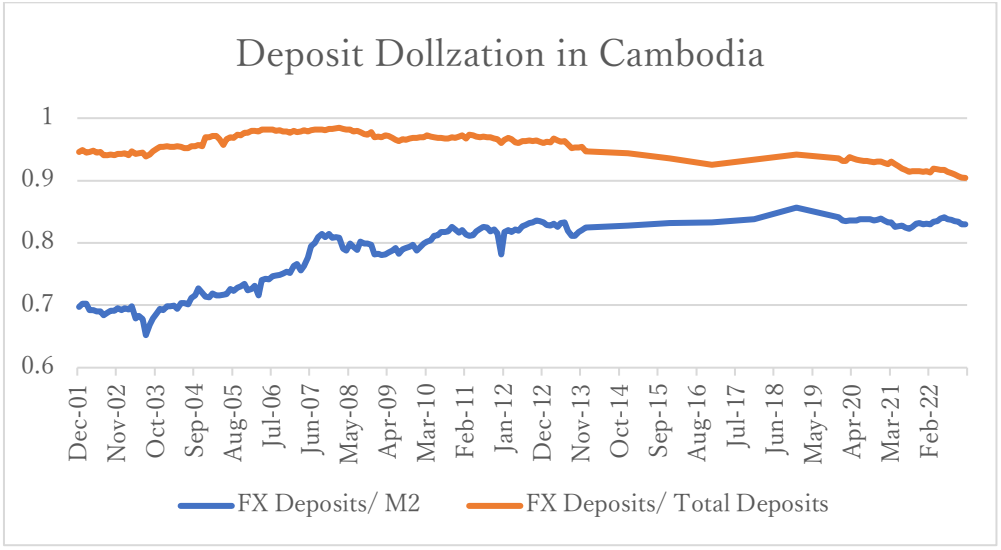
1.Introduction

Financial dollarization is still persistent in developing counties. Although dollarization complements the malfunction of the local financial system to some extent, it generally limits the effectiveness of domestic monetary policy. The malfunction of lender of last resort also causes inefficiency in the banking system since local banks need to keep too much excess liquidity to protect themselves from liquidity shocks (Delechat et al. 2012; Aiba and Okuda 2021).

Cambodia is one of the highly dollarized economies. Foreign currency (FX) deposits have dominated around 95% of total deposits in the banking sector (Figure 1). The extent of dollarization has been persistent for two decades, while the current macroeconomic conditions have been stable (Menon, 2008; Samreth and Okuda 2019). To address the persistent dollarization, the National Bank of Cambodia (NBC), the central bank of Cambodia, has announced and implemented a series of policy measures for the promotion of local currency (LC) over the past years. In December 2016, the NBC announced a measure for all the registered financial institutions to keep 10% of their loan portfolios in local currency by December 2019. In May 2020, the NBC announced that fee charges on acceptance of small FX banknotes will be newly adopted from September 2020. The ratio of FX deposit to total deposits has been reduced to about 90% as of 2022 because of NBC's recent policy measures (IMF 2019), although the level of dollarization remains high in Cambodia.

Figure 1: Trends in Deposit Dollarization in Cambodia



Source: Monetary Survey, National Bank of Cambodia

There are also several empirical studies on dollarization from both macro- and micro-economic perspectives in Cambodia. Using macroeconomic indicators, Samreth (2011) empirically showed that deposit dollarization in Cambodia has been persistent and the depreciation of local currency also leads to higher extent of dollarization. For the micro-level evidence, Aiba et al. (2018) investigated the factors behind recent currency choice in loans by Cambodian households and showed that the choice of foreign currency is a consequence of risk-hedging behavior to mitigate exchange rate risks by Cambodian households with FX income. Okuda and Aiba (2018) investigated borrowing by firms and showed that those with FX revenue are likely to borrow more than those with LC revenue. The authors suggest that underdevelopment of loan market in local currency makes it difficult for firms with local currency to access loans and to hedge exchange rate risks in borrowing. Odajima et al. (2019) investigated the currency choice in domestic transaction by Cambodian households and showed that the use of foreign currency in domestic transaction is caused by the difficulty in using local currency for large transactions, the underdevelopment of a settlement network in the local currency, and the strong network externalities of the USD.

However, there is no micro-evidence of FX saving behavior in Cambodia. Furthermore, studies on household behavior in making FX deposits have been also scarce in the literature of dollarization. Stix (2011) investigated selected central and eastern European countries (CEECs) and showed that network externalities are a significant factor in explaining the choice of FX deposits. Brown and Stix (2014) advanced the debate by employing a larger cross-country household survey in CEECs. They examined the hypotheses of portfolio selection proposed by Ize and Levy-Yetagi (2003), and network externalities and relation of demographic factors and financial literacy with the choice of FX deposits. They showed that expectations of exchange rate and inflation rates are correlated with the choice of FX deposits, in-line with the portfolio selection model, and higher income levels are associated with a higher FX deposit share.

Our paper bridges this gap in the empirical literature of deposit dollarization by investigating Cambodian household behavior in having FX deposits using unique micro data[1]. Our data is a nation-representative sample of 2233 households, which were collected through face-to-face interview in 2017. In addition, our empirical analysis differs from Stix (2011) and Brown and Stix (2014) in two ways. First, apart from choice in currency, we consider a linkage of financial access of households with dollarization. The majority of Cambodian households do not have

[1] In this paper, the foreign currency mainly referred to is USD. Although it is true that the households near the Thai border additionally use Thai Baht in their daily transactions, the choice of THB deposits are rare. In recent years, the Yuan has also been used by Chinese people in Cambodia. However, the use of CHY is limited to among Chinese people, and the volume of CHY in deposits is still very small compared to the entire banking system.

deposits due to the underdevelopment of the financial markets and low income. In addition, there is a correlation between income levels and usage of foreign currency in their expenditure and income decisions according to Aiba et al. (2018) and Odajima and Aiba (2018). Therefore, an analysis based exclusively on choice of currency in deposits does not wholly capture the nature of dollarization, as LC deposits have increased recently in rural areas. Our model is extended to capture the access of rural households to bank deposits to investigate the benefit of financial inclusion for the promotion of local currency.

In addition, we consider the complementary roles of FX and LC deposits in the empirical model. In other words, our model is designed to explain the household behavior of having deposits in both currencies. In the empirical literature of dollarization, analysis has been focused on currency substitution, as in which currency households choose for deposit accounts (Brown & Stix, 2014; Krupkina and Ponomarenko, 2017). However, interest rates on LC deposits are generally higher than those on foreign currency deposits, while there is a risk of high depreciation in the local currency of developing countries. In the context of Cambodia, the real and payment dollarization prevails accross the country, and the stability of foreign currency is attractive to households. Thus, households are likely to diversify their portfolio by taking both of different return- and risk-profile deposits. In our analysis, we consider this household behavior by adopting a bivariate Probit model, and we also estimated the substitution pattern between FX deposit and LC deposits, following Eugenio-Martin and Campos-Soria (2011).

As a result of our analysis, we firstly find that the factors predicted from portfolio selection theory on FX saving behavior do not fit in the Cambodian households. Most of the variables of expectation of inflation and exchange rate changes and volatility are not significantly correlated to making FX and local deposits. However, we find that currency choice is still to some extent affected by household expectations of inflation rates and exchange rates, and the appreciation of local currency and stable inflation rate would facilitate local currency deposits. In addition, regarding risk-hedging behavior, the ratio of FX expenditure to total expenditure is not significantly correlated to the choice of currency, while the ratio of FX income to total income is highly correlated negatively to making LC deposits and positively to having FX deposits. This means that households choose a deposit account in the currency they receive as income. Again, the finding is not consistent with the prediction from the theoretical model. Theoretically, risk-hedging households would choose the same currency in deposits as the currency they use for consumption in order to mitigate the risks of exchange rate shocks on their future consumption (Aiba et al., 2018). However, our findings suggest that the currency of the income stream is a more important determinant for households. In contrast to the prediction from the

portfolio selection model, presumably, Cambodian households do not care or are unaware of the risk of exchange rate shocks in their asset values.

Secondly, we find that higher income levels are associated with an increase in both FX deposits and LC deposits, suggesting that an increase in income leads to financial access. From further exploration on the effect of income, we find that the marginal effects of income vary across income levels. The marginal effects are larger on LC deposits for lower-income households, and smaller for higher-income households. In addition, by estimating sub-samples of rural and urban households, respectively, we find that this trend is particularly the case in rural areas. Thus, we conclude that an improvement in living conditions for lower-income and rural households would facilitate promotion of local currency in deposits in formal financial institutions and would reduce the ratio of FX deposits in the financial sector.

Lastly, we find that an estimated coefficient of cohort dummy of people at more than 40 years old has a different sign from previous findings. Stix (2013) showed that cohorts in CEECs which experienced financial crisis in 1990s have higher likelihood to have FX deposits than other cohorts. From this finding, he suggests that memories of crises in the banking sector will reduce trust in the local currency and lead to persistent dollarization. However, our analysis reveals the opposite, older people tend to choose LC deposits, even though those cohorts experienced the devastation of the banking sector under the Pol Pot regime. Menon (2008) argued that the persistence of the Cambodian dollarization was not due to bad performance and instability of the macroeconomic conditions, as the macroeconomic conditions had been stable and economic growth had been high. He showed that the persistence was contributed by increasing fund flows by foreign investors as the Cambodian economy recovered from the past political disaster. In line with his hypothesis, our findings may suggest that the recent dollarization in Cambodia is not because of any distrust in local currency and the banking sector.

The rest of our paper is organized as follows. Section 2 presents the literature review and hypotheses to be examined in our paper. Section 3 presents our empirical model and data description. The empirical results are presented in Section 4 and Section 5 concludes.

2.Hypotheses

2.1 Literature review of dollarization

There is a strand of the literature which investigated the mechanism of dollarization using portfolio selection model. The seminal paper of this literature is Ize and Lavy-Yeyagi (2003), which proposed a mean-variance model to explain the optimal level of currency composition in assets and liabilities held by economic agents based on return and risks. Luca and Petrova

(2007) extended this model to explain the general equilibrium in the economy where banks and enterprises exist. However, their model does not consider household behavior in having FX deposit. In contrast, Okuda (2017) further extended Luca and Petrova's model to include the household sector to endogenously determine the level of deposit dollarization and explain the difference in degree of dollarization among ASEAN countries. He developed a model of household behavior based on the mean-variance framework as Ize and Lavy-Yeyagi (2003) proposed. In addition, as Luca and Petrova (2007) showed that for enterprises' FX borrowing, Okuda's model explains the nexus between real/payment dollarization and financial dollarization. One of the motives of saving behavior is a pre-cautionary purpose. Thus, people save in the currency to hedge the risks of decrease in asset values relative to price of goods in the future purchase, meaning that the correlation between price of goods and exchange rate affected the demand for FX deposits.

There is a vast literature that empirically examines the portfolio selection model to explain dollarization. Using micro data, Fidrmuc et al. (2013) examined the portfolio selection hypothesis and found that exchange rates and inflation rates are associated with household choice of foreign currency in borrowing. In Cambodia, Aiba et al. (2018) investigated the factors behind FX borrowing by households and found that expectation of exchange rate movements is correlated to FX borrowing in line with the theory. In addition, they found that FX income are correlated to FX borrowing, suggesting that households match the currency between income and debts to hedge the risks of exchange rate fluctuations.

However, there is a scarcity of empirical studies on FX saving behavior by households. Brown and Stix (2014) examined both stated and revealed preference of choice of FX deposits using survey-based data. They found that the factors predicted from the portfolio selection model, especially expectations of inflation rates and exchange rates, and the expected volatility in these rates, are associated with the stated and revealed preference of FX deposits. Temesvary (2016) developed the depositor's discrete choice model to examine the demand elasticity of interest rate spreads in loans and deposits using cross-country macro data from 16 CEECs. Scheiber and Worz (2018) also investigated how a reduction in interest rate spread affected euroization.

2.2 Portfolio Selection Model

Following Okuda (2017), we develop a theoretical model to explain household saving behavior under the mean-variance framework. A representative household utility is determined as $\Pi = rD + r^*(1+e)D^* - P \cdot G(h)$, where D and D^* are domestic and foreign currency deposits and r, and r^* are interest rates on domestic deposits and foreign currency, respectively. e is exchange rate and P is a price of goods. We assume that P is correlated with

e, and correlation coefficient is denoted as σ_{eP}. Under the high degree of payment and/or real dollarization, the price of goods is highly correlated with exchange rate. In other words, payment and/or real dollarization becomes intense as $\sigma_{\epsilon P}$ grows. $G(h)$ represents the amounts of goods households would purchase, and we suppose that it is an increasing function of income h, where $h = D^* + D$. In Okuda (2017), household expenditure for goods is set as P. However, this setting does not capture the reality that expenditure depends on household wealth. Thus, we assume that household expenditure increases as income level h increases.

We assume that risk-averse households choose the optimal D^* to maximize the utility function, $EU = E(\Pi) - \frac{1}{2}\mu Var(\Pi)$, under the budget constraint, $h = D^* + D$. μ represents degree of risk-aversion of households. The first order condition gives the following household demand functions for foreign currency deposits and local currency deposits:

$$D^* = \frac{1}{\mu\sigma_e^2 r^{*2}} \cdot \left(r^*\left(1 + E(e)\right) - r + \mu\sigma_{eP} r^* G(h)\right)$$

$$D = h - \frac{1}{\mu\sigma_e^2 r^{*2}} \cdot \left(r^*\left(1 + E(e)\right) - r + \mu\sigma_{eP} r^* G(h)\right)$$

These demand functions show the important nature of household behavior in having FX and local currency deposits. First, an increase in the volatility of exchange rate σ_e^2 would decrease demand for FX deposits and instead increase demand for local currency deposits. Second, an increase in expected exchange rate (depreciation of local currency) would increase demand for FX deposits and decrease demand for local currency deposits. Third, the interest rate differential between FX deposits and local currency deposits would increase FX deposits and decrease local currency deposits.

In addition, the degree of payment/real dollarization would also affect the choice of currency in deposits by households. If $\sigma_{\epsilon P}$ is large enough, FX deposits could be a natural hedging device to avoid the risk of inflation rate changes, and a decrease (increase) in σ_e^2 can be interpreted as the risk of inflation rate change (increases or decreases) relative to the volatility of the exchange rate. In other words, as $\sigma_{\epsilon P}$ becomes smaller, a foreign currency deposit does not work anymore as a natural hedging device and becomes a risky asset for households. In the model, the risk of inflation rate changes does not essentially affect the choice of currency. It is because there is no choice for hedging the risk of inflation rate change. In the case of Cambodia, levels of payment dollarization and real dollarization are different from region to region (Odajima and Khou 2017; Aiba et al, 2018; Odajima et al. 2019). Thus, the levels of payment

and real dollarization would explain the household FX depositing behavior in the case of Cambodia.

Regarding payment dollarization, Uribe (1997) theoretically explains how hysteresis occurs when households choose currencies in transactions. Uribe's model assumes that the experience of FX use would decrease the transaction cost of using foreign currency in the next period. This experience works to ensure persistence of payment dollarization after a shock happens in macroeconomic factors. Valve (2010) empirically showed that network externalities drive households to use foreign currency in transactions. Stix (2013) investigated the factors behind FX deposit behavior by households in CEECs. He showed that the perception of FX usage in a region, which is a proxy for network externalities, is associated with the choice of FX deposits. In the context of Cambodia, Odajima et al. (2019) further investigated whether the determinants of foreign currency usage of households are correlated to the average use of FX in the region.

Furthermore, our model shows that an increase in income level, *h,* would increase both local and FX deposits, suggesting that wealthier households tend to diversify their assets in terms of currency composition.

2.3 Financial Inclusion and Financial Literacy

The literature of dollarization pays less attention to the nexus between financial inclusion and dollarization. As Odajima et al. (2017) revealed, the use of local currency is higher in rural areas. However, there are challenges for rural households in accessing bank deposits because of physical distance and low financial literacy. If such unbanked rural households have access to formal deposits, local currency deposits would increase. Thus, we speculate that, apart from the factors in our model above, factors relating to financial inclusion will also increase local currency deposits, particularly in rural areas. There is a vast literature on financial inclusion for formal deposit-taking financial institutions. Some studies have found that physical distance between financial institutions and households could be a hurdle for financial access. In this regard, Brown et al. (2016) show that the areas where microfinance institutions have newly opened a branch show higher ratios of households having an account at financial institutions. Apart from physical distance, Allen et al. (2016) showed that legal rights, lower account cost, and political stability are also associated with financial inclusion across countries. Zins and Will (2016) further document that lack of documentation, trust in banks, lack of money, and religious reasons are also perceived by households as barriers to formal finance institutions. Trust in banks is also empirically found to be the determinant of foreign currency deposits by Brown and Stix (2014). However, the previous studies suggest that trust in banks also affects financial

access. Thus, when we consider access to finance in the empirical analysis, it is not clear how increases in trust in banks by households will affect access to local currency deposit.

Financial literacy works to facilitate rural households to save money. Calderone et al. (2018) examined the impact of financial education program on saving behavior by implementing an experiment on 3000 clients of the FINO payment Foundation and found positive results on this impact. From a large-scale survey of 25000 households, Yoshino et al (2017) also found that level of financial literacy and education are both associated with financial behavior. Grohmann et al (2018) investigated a large sample of 1000 adults for each of 142 countries, and their results also support the positive nexus between financial literacy and financial inclusion.

Furthermore, in the literature of financial literacy, Von Gaudecker (2013) show that risk-hedging households will diversify their asset allocation. This study looked at how diversification of household portfolio varies with improvements in financial literacy. Especially, they documented the finding that increases in income and financial literacy promote people to disperse the risks by diversifying the assets. Thus, we conjecture that financial literacy will positively affect both of LC deposits and FX deposits by promoting asset diversification.

In Table 1, we summarize the potential factors which theoretically could affect access to FX and local currency deposit by households. In the next sections of the paper we empirically examine these factors using the nation-representative survey-based data of Cambodian households.

Table 1: Hypotheses of Determinants of FX deposits and local currency (LC) deposits

Variables	Expected effects	Theoretical foundation
Interest rate differential between FX and local currency deposits	FX deposits (+) LC deposits (-)	Portfolio selection
Depreciation expectation	FX deposits (+) LC deposits (-)	Portfolio selection
Perception of Inflation rate volatility	FX deposits (+) LC deposits (-)	Portfolio selection
Perception of exchange rate volatility	FX deposits (-) LC deposits (+)	Portfolio selection
Currency composition in expenditure	FX deposits (+) LC deposits (-)	Pre-cautionary saving

Income level/Wealth	FX deposits (+) LC Deposits (+)	Asset diversification
Financial literacy	FX deposits (+) LC Deposits (+)	Asset diversification and Financial Access
Trust in banks	FX deposits (+) LC Deposits (+)	Financial Access
Physical distance from banks	FX deposits (+) LC Deposits (+)	Financial Access

3. Empirical Method

3.1 Empirical Model

We construct the empirical model to capture the nature of depositor behavior in dual currencies.[2] Choices of deposit currencies are (1) to choose local currency deposits, (2) to choose FX deposits, (3) to choose both of local currency and FX deposits, and (4) not to choose any deposits. The decision of having FX deposits may not be independent of the decision of having LC deposits. Indeed, having both of the deposits could reduce exchange rate risks in household asset portfolio. Hence, independent Probit regressions could be misleading. To integrate this household behavior in the empirical model, we use a bivariate Probit model, following Eugenio-Martin and Campos-Soria (2011). The specification of the model is as follows:

$$\begin{cases} y_l^* = X\beta_l + e_l \\ y_f^* = X\beta_f + e_f \end{cases}$$

where X are the variables of household characteristics. The subscript *l* represents the choice of whether to have a local currency deposit, and subscript *f* represents the choice of whether to have a FX deposit.

The latent variable is defined as an index such that:

$$y_c = \begin{cases} 1 & \text{if } y_c^* \geq 0 \\ 0 & otherwise \end{cases} \quad \forall\, c \in \{l, f\}$$

The advantage of the model is that it allows for correlation of the error terms. Specifically, e_l and e_f follows the following joint standard normal distribution with mean zero, and Corr (e_l, e_f) is ρ. The model allows us to capture the financial access to formal deposits, as probability

[2] For a detailed explanation of a bivariate Probit model, see Cameron and Trivedi (2005).

of having bank deposits are calculated as $Prob(y_l = 1 \cup y_f = 1)$. If a variable affecting the promotion of local currency deposits, we should examine whether changes in the variable positively affect $Prob(y_l = 1 \cap y_f = 0)$, as households are more likely to choose local currency deposits.

3.2 Data description

We employ survey-based data, collected under a joint project between the National Bank of Cambodia (NBC) and JICA Ogata Research Institute (JICA-Ogata-RI) from July to November 2017. In this survey, 2,233 households, nationally representative from all 25 provinces, were randomly selected and interviewed face-to-face. The survey questionnaire covered questions related to income, expenditure, savings, and borrowings, by type of currencies. The questionnaire also included household attributes such as age, gender, marital status, educational levels, financial literacy, and perceptions about future price and exchange rates.

Among 2,233 households[3], only 788 households have deposits at banks or microfinances. By types of currencies, 612 households have accounts in KHR and 276 households have them in USD, while there are also 100 households that have accounts in both currencies.

Table 2: Access to bank deposits by types of currencies

Variables	Number of households
Local currency deposit	612
Foreign currency deposit	276
LC and FX deposit	100
Only LC deposit	512
Only FX deposit	176
No deposit at financial institutions	1,445
Total households	2,233

Source: The JICA-NBC Survey 2017

Regarding the determinants of currency in deposits, based on the portfolio selection model, we include expectations on future inflation and exchange rates, as well as the perception on their volatilities. For inflation expectation, we create two dummy variables, for those who expect that the price will rise more sharply in the next year and those who, in contrast, expect deflation. If people expect high inflation, they should prefer an FX deposit rather than a LC deposit, and

[3] We lost information on 40 households that did not inform us whether they have access to bank deposits or not.

vice versa for those who believe a deflation will occur next year, relatively to households who expect low and stable inflation. Similarly, for the exchange rate expectation, we also create two dummy variables: Expectation for an appreciation of LC in case they believe the exchange rate will be below 3,900 KHR/USD next year, or a depreciation of LC in case they find the exchange rate will be more than 4,100 KHR/USD. Our assumption is that if people expect an appreciation of LC, they should prefer LC deposits and vice versa, relative to households who expect a stable exchange rate (between 3,900 KHR/USD and 4,100 KHR/USD).

Concerning the volatilities of inflation and exchange rate, we use the answers from the question: *"To what extent are you certain about the future inflation/exchange rates in the next year?"* We classify those who answered that they were very uncertain or quite uncertain as those who perceive that the inflation/exchange rates are volatile. Based on the portfolio selection model, a high volatility of exchange and inflation rate would induce households to prefer FX saving than LC saving. Given that many people answer *"Don't know"* to these questions on the expectation of future inflation/exchange rates as well as their volatilities, we create dummy variables that take the value "1" if the respondents answered "*Don't know*" to each question above.

Table 3: Currency deposits and perception on future inflation and exchange rate

VARIABLES	LC deposit		FX deposit		Total	
	Mean	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
Inflation expectation						
Expecting for a high inflation	0.12	0.33	0.15	0.36	0.11	0.31
Expecting for a deflation	0.03	0.16	0.01	0.12	0.02	0.15
Don't know	0.31	0.46	0.26	0.44	0.36	0.48
Exchange rate expectation						
Expecting for an appreciation of local currency (lower than 3,900 KHR/USD)	0.01	0.10	0.01	0.10	0.01	0.10
Expecting for a depreciation of local currency (higher than 4,100 KHR/USD)	0.20	0.40	0.28	0.45	0.20	0.40
Don't know	0.41	0.49	0.33	0.47	0.47	0.50
Inflation volatility						
Uncertain about future inflation	0.16	0.36	0.15	0.36	0.16	0.37
Don't know	0.32	0.47	0.28	0.45	0.37	0.48
Exchange rate volatility						
Uncertain about future exchange rate	0.13	0.34	0.09	0.28	0.10	0.31
Don't know	0.41	0.49	0.33	0.47	0.47	0.50

Source: The JICA-NBC Survey 2017

To test the pre-cautionary saving hypothesis, we include the ratio of FX expenditure. We assume that households will choose deposit currency that they plan to use for transactions. Thus, a higher ratio of FX in expenditure should lead households to save more in FX. We also include the ratio of FX in income. Even though household can mitigate the exchange rate risks by adjusting currency composition of deposits to that of expenditure, transaction costs of converting currency may discourage households from adjusting the currency in deposits. Or some households do not care the exchange rate risks in their assets, as Aiba et al. (2018) found that higher educated Cambodian households are more likely to adjust the currency composition of loans to that of income and assets. Thus, we also examine whether the currency choice in savings can be influenced by the currency composition in their income.

Table 4: Currency deposits and pre-cautionary saving

VARIABLES	LC deposit		FX deposit		Total	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Ratio of foreign currency in household expenditure	14.5	18.4	22.9	21.6	13.2	18.8
Having household loan in USD	0.29	0.45	0.35	0.48	0.25	0.44
Having household loan in KHR	0.07	0.25	0.02	0.13	0.08	0.27
Ratio of foreign currency in household income	22.0	24.4	44.5	30.4	28.5	30.6

Source: The JICA-NBC Survey 2017

To test the hypotheses regarding financial access and asset diversification, several variables are included in our analysis. First, we include the logarithm of income per capita, as well as measures of financial literacy and trust in the banking system. The latter two variables are based on self-assessment questions that inquire about an individual's overall knowledge of financial matters and their trust in the banking system, respectively,[4] We anticipate that higher levels of income, financial literacy, and trust in the banking system will encourage financial access among households, and therefore, will have a positive impact on both LC and FX deposits.

In addition, we also include dummy variables that represent household locations, as physical distance and difference in economic conditions could also affect financial access. First, we include variables of household living in rural areas. Second, we include the dummy variable of household living in Phnom Penh or Siem Reap, where inflows of FDIs and foreign tourists are

[4] To avoid bias in answers, we did not reveal to interviewees that the NBC was involved in the survey.

especially large compared to other cities. In those cities, infrastructures are well-developed, and density of bank branches is high. Thus, the financial access is expected to be higher than other areas.

Furthermore, we control for other relevant household characteristics such as education level, age of household head, location of household, and household size in terms of the number of family members.

Table 5: Financial access and household characteristics

VARIABLES	HHs without deposits		HHs with LC deposits		HHs with FX deposits		Whole Sample	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Log of income per capita	4.92	1.07	5.30	0.90	5.57	0.93	5.07	1.04
High level of financial literacy	0.03	0.16	0.08	0.27	0.11	0.31	0.05	0.21
Trust in banking system	0.53	0.50	0.68	0.47	0.74	0.44	0.59	0.49
Low education of household head (primary school or below)	0.60	0.49	0.31	0.46	0.36	0.48	0.50	0.50
Young household head (less than 40 years old)	0.24	0.43	0.18	0.38	0.28	0.45	0.23	0.42
Household size (number of family members)	4.50	1.79	4.77	1.92	4.93	2.00	4.61	1.84
Household in Phnom Penh or Siem Reap	0.11	0.32	0.08	0.28	0.19	0.39	0.12	0.32
Household in rural area	0.53	0.50	0.37	0.48	0.34	0.47	0.47	0.50

Source: The JICA-NBC Survey 2017

Due to the data limitation, our estimation applies cross-sectional data. Thus, we do not explicitly control the macroeconomic factors, such as interest rate difference between foreign and local currency deposits, although some of previous studies focused on impacts of those variables (Basso et al. 2011). In our analysis, we assume that differences in macroeconomic variables are marginal across regions in Cambodia, and there are unique effects of macroeconomic variables on each Cambodian household in our sample.

4. Empirical Results

4.1 Baseline Results

We estimate the bivariate Probit model of having LC deposits and FX deposits, and the result of the estimation is shown in Table 6. Cluster-robust standard errors are applied at province level. And the marginal effects of variables are calculated and shown in the table. First, we find that inflation and exchange rate expectations do not have strong impacts on choice of currency deposit. Specifically, marginal effects of most of variables of perceptions of inflation and exchange rate are not statistically significant in the probability of having LC deposits. This means that local currency is not driven by behavior to maximize return on asset portfolios. For having FX deposits, dummies for deflation and dummies for depreciation of local currency are estimated as negative and positive, respectively, at 5% statistical significance. These results suggest that households who expect a deflation tend to choose fewer FX deposits, and those who expect a depreciation of LC are more likely to deposit in FX in line with the portfolio selection model.

Regarding the volatility of inflation and exchange rates, people who are uncertain about the future inflation tend not to deposit their money in LC, while those who are uncertain about the future exchange rate are more likely to choose LC deposits. These findings are in line with theoretical arguments. However, it is noted that there is also a high proportion of households who answered *"Don't know"* to the questions on volatilities of inflation and exchange rate (37% and 47%, respectively). The lack of a strong relationship between inflation/exchange rate expectations and currency choice could be due to the managed floating regime that Cambodia has adopted, making the inflation and exchange rate strongly stable in the last two decades, which led many people to continue to expect stable inflation and exchange rates or answer *"Don't know"* to those questions.

We find that the ratio of FX expenditure to total expenditure is not significantly correlated to the choice of LC deposits, while it is positively correlated to FX deposits at 1% statistical significance. It means that households are likely to have FX deposits if they use foreign currency in their daily payment, but households do not necessarily choose LC deposits if the ratio of FX expenditure decreases. The finding does not support the risk-hedging hypothesis for having FX deposits that households are likely to choose a currency for deposits that will mitigate the risks of exchange rate shocks on their future consumption. However, this finding does not imply that the behavior of LC deposits is not driven by risk-hedging for future consumption shocks.

However, the ratio of FX in household income is significantly related to both LC and FX deposits. The ratio of FX in household income is negatively correlated to having LC deposits, and it is positively correlated to FX deposits. This means that households deposit their money

in the currency they receive as income. Furthermore, the estimated marginal effects of the ratio of FX income is higher than the ratio of FX expenditure; a 1% decrease in FX income ratio is associated to the 1.5% reduction in FX deposit ratio in the head account. The result suggests that households are rather affected by the currency composition in income when they choose currency in deposit accounts. The results are also important for the promotion of LC. Reduction in use of foreign currency for wage payment and sales could change the currency composition of bank deposits.

Again, this could be justified by the stable exchange rate in Cambodia that has varied around 1 percent only in the last decade, and consequently, many people do not hedge against the risk of exchange rate fluctuations. In addition, it might be due to a low level of FX in household expenditure as the average equals 13.2 % with a median of only 5.3 percent, meaning that households do not really care about matching currency in their deposits to currency in their expenditures.

Table 6: Regression results

VARIABLES	(1) LC deposit	(2) FX deposit	(3) ρ
Expecting for a high inflation	0.0420	0.00571	
	(0.0995)	(0.113)	
Expecting for a deflation	0.0839	-0.696**	
	(0.200)	(0.322)	
Don't know about future inflation	0.801*	-0.739**	
	(0.413)	(0.356)	
Expecting for an appreciaiton of local currency (lower than 3,900 KHR/USD)	-0.144	-0.0754	
	(0.316)	(0.409)	
Expecting for a depreciation of local currency higher than 4,100 KHR/USD)	-0.0968	0.217**	
	(0.0837)	(0.0999)	
Don't know about future exchange rate	0.367	5.357***	
	(0.540)	(0.237)	
Uncertain about future inflation	-0.228***	-0.0202	
	(0.0839)	(0.107)	
Don't know about future volatility of inflation	-0.901**	0.687*	
	(0.401)	(0.366)	
Uncertain about future exchange rate	0.253**	-0.274**	
	(0.110)	(0.133)	
Don't know about future volatility of exchange rate	-0.447	-5.530***	
	(0.528)	(0.169)	
Ratio of foreign currency in household expenditure	0.004	0.006***	
	(0.003)	(0.002)	
Ratio of foreign currency in household income	-0.008***	0.009***	
	(0.001)	(0.001)	
Log of income per capita	0.108***	0.228***	
	(0.0367)	(0.0469)	
High level of financial literacy	0.364***	0.542***	
	(0.125)	(0.112)	
Trust in banking system	0.254***	0.411***	
	(0.0686)	(0.0671)	
Low education of household head (primary school or below)	-0.620***	-0.201**	
	(0.0814)	(0.0851)	
Young household head (less than 40 years old)	-0.389***	0.0529	
	(0.0807)	(0.0845)	
Household in Phnom Penh or Siem Reap	-0.221***	0.243***	
	(0.0716)	(0.0482)	
Household in rural area	-0.275***	-0.231***	
	(0.0945)	(0.0676)	
Constant	-0.562**	-2.857***	0.165**
	(0.242)	(0.274)	(0.0642)
Observations	2,205	2,205	2,205

Note: *** p<0.01, ** p<0.05, * p<0.1. Data is from the JICA-NBC Survey 2017. We estimated the bivariate Probit model with cluster robust standard errors at provincial level. The standard errors are shown in parentheses.

The age of household head and household location also play a role. However, the results are opposite to previous studies. Stix (2013) found that older cohorts in CEECs are more likely to have FX deposits than younger cohorts because of their past experiences of financial crisis in early 1990s. Given that Cambodia had to pass through the Khmer Rouge regime between 1975 and 1979 when LC was totally destroyed, we expected that older household heads would prefer a deposit in FX rather than LC, compared to younger household heads. In contrast, we found that young household heads, defined as those who are less than 40 years old, are less likely to have LC deposits, though no relationship is found between age and having FX deposits. Meanwhile, households who are located in major cities such as Phnom Penh and Siem Reap tend to have their deposits in FX rather than LC. This is conforming to previous studies that dollarization in Cambodia is a rather urban phenomenon and concentrates in major cities that expose to FDI and tourism.

With regard to financial access, higher income, high level of financial literacy, and trust in banking system and household size lead to higher financial access, for both FX and LC deposits. Similarly, education also plays a role as households with low education (household heads with primary school or below) are less likely to have access to financial deposits. Finally, households in rural area are less likely to deposit their money at financial institutions. Promoting financial inclusion in rural areas should therefore lead to increases in LC deposits.

4.2 Difference in Saving Behavior in Urban vs. Rural Areas

We also estimate the models for sub-samples of rural households and urban households, respectively. The use of foreign currency by households are different between urban and rural areas, and so are income levels and education levels. Thus, expectation of inflation rate and exchange rate, and perception of FX currency risks might be different between two areas, which will affect the awareness of inflation rate and exchange rate risks. The results of these estimations are presented in Table 7.

First, we find that the size of the marginal effect and statistical significance are different in the expectation of inflation rate and exchange rate between rural and urban areas. In addition, the results for perception of uncertainty of exchange rate and inflation rate are also different between rural and urban areas. In rural areas, exchange rate appreciation for local currency increases the probability of LC deposits, and the uncertainty of inflation rate reduces LC deposits. This means that keeping expectation of lower inflation rate, and unleashing the exchange rate to appreciate for local currency are associated with increases in LC deposit. However, in urban areas, the estimated marginal effects of expectations of inflation and exchange rates for having LC deposit is different to the predictions of the theoretical models, while the results in FX deposits are consistent with the theoretical model. This suggests that

households in urban areas might not care about the inflation rate and exchange rate risks when choosing to make LC deposits.

The ratio of FX expenditure is only statistically significant for FX deposits in urban areas. This means that households in urban areas tend to engage in risk-hedging by matching the currency composition of assets with the currency composition of expenditures, while households in rural areas seem not to care about such risks when they make deposits.

Interestingly, in rural areas, the low education dummy is significantly associated with a lower probability of having LC deposits. This means that the education level is important for access to LC deposits but increases in financial literacy do not necessarily lead to LC deposits.

Table 7: Estimation with sub-sample of rural and urban households

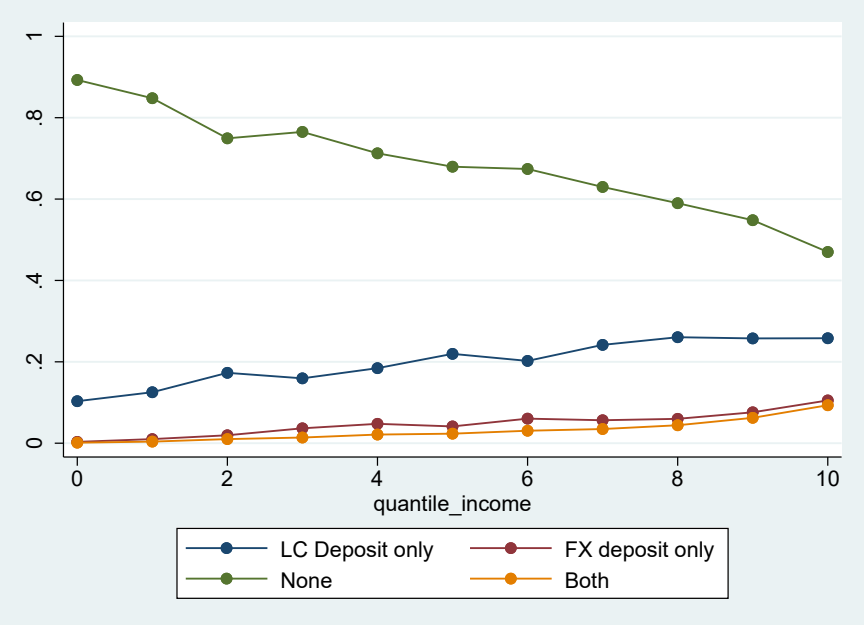
	Households in Rural Areas			Household in Urban Areas'		
	(1)			(2)		
VARIABLES	**LC deposit**	**FX deposit**	**ρ**	**LC deposit**	**FX deposit**	**ρ**
Expecting for a high inflation	-0.152	-0.0753		0.204*	-0.0115	
	(0.201)	(0.240)		(0.104)	(0.124)	
Expecting for a deflation	-0.0826	-0.251		0.276	-0.901**	
	(0.290)	(0.248)		(0.266)	(0.396)	
Don't know about future inflation	0.511	-0.655		1.185**	-0.700	
	(0.597)	(0.493)		(0.537)	(0.434)	
Expecting for an appreciaiton of local currency (lower than 3,900 KHR/USD)	1.104**	0.217		-6.264***	-0.273	
	(0.474)	(0.618)		(0.241)	(0.470)	
Expecting for a depreciation of local currency higher than 4,100 KHR/USD)	-0.107	0.224		-0.0780	0.206*	
	(0.151)	(0.193)		(0.106)	(0.118)	
Don't know about future exchange rate	4.743***	4.384***		-0.248	5.543***	
	(0.290)	(0.343)		(0.963)	(0.335)	
Uncertain about future inflation	-0.351**	-0.0846		-0.186	0.00325	
	(0.173)	(0.197)		(0.124)	(0.127)	
Don't know about future volatility of inflation	-0.509	0.657		-1.343***	0.585	
	(0.603)	(0.478)		(0.517)	(0.415)	
Uncertain about future exchange rate	0.150	-0.393**		0.330**	-0.212	
	(0.156)	(0.184)		(0.133)	(0.216)	
Don't know about future volatility of exchange rate	-4.816***	-4.612***		0.131	-5.688***	
	(0.279)	(0.288)		(0.981)	(0.306)	
Ratio of foreign currency in household expenditure	0.005	0.005		0.00377	0.006***	
	(0.004)	(0.003)		(0.003)	(0.002)	
Ratio of foreign currency in household income	-0.008***	0.007***		-0.010***	0.011***	
	(0.001)	(0.002)		(0.002)	(0.002)	
Log of income per capita	0.147***	0.249***		0.0515	0.214***	
	(0.0558)	(0.057)		(0.052)	(0.061)	
High level of financial literacy	0.353	0.537***		0.402**	0.545***	
	(0.258)	(0.181)		(0.185)	(0.137)	
Trust in banking system	0.179*	0.671***		0.301***	0.277***	
	(0.101)	(0.137)		(0.0745)	(0.105)	
Low education of household head (primary school or below)	-0.716***	-0.0814		-0.558***	-0.289***	
	(0.119)	(0.149)		(0.0855)	(0.103)	
Young household head (less than 40 years old)	-0.188*	0.165		-0.563***	-0.0606	
	(0.114)	(0.140)		(0.121)	(0.107)	
Household in Phnom Penh or Siem Reap	-0.310***	0.108		-0.159**	0.305**	
	(0.119)	(0.174)		(0.0745)	(0.129)	
Constant	-1.053***	-3.332***	0.188**	-0.237	-2.710***	0.146**
	(0.319)	(0.373)	(0.0872)	(0.336)	(0.349)	(0.0634)
Observations	1,032			1,173		

Note: *** p<0.01, ** p<0.05, * p<0.1. Data is from the JICA-NBC Survey 2017. We estimate**d** the bivariate Probit model with cluster **r**obust standard errors at province level. The standard errors are shown in parentheses.

4.3 The role of income and financial access

The bivariate Probit model allows for an estimation of the joint probabilities of selecting LC, F, none or both deposits conditional on the values of independent variables. In Table 6, the estimation result reveals that household income per capita has allowed households to have access to deposits at financial institutions in both currencies. However, the ratio of FX currency in household income, expenditure and saving could be associated with the level of income, respectively. Therefore, it is necessary to investigate how the probabilities of having LC or FX deposits may change with variations of household income. To do so, following Eugenio-Martin and Campos-Soria (2011), we estimate the joint probabilities of selecting LC, FX or both deposits conditional on the values of independent variables. We divide the household income into ten deciles, and then, within each decile, we calculate the median of probabilities to choose only LC deposits ($Prob(y_1 = 1 \cap y_2 = 0)$), only FX deposits ($Prob(y_1 = 0 \cap y_2 = 1)$), No deposits ($Prob(y_1 = 0 \cap y_2 = 0)$), both deposits ($Prob(y_1 = 1 \cap y_2 = 1)$), respectively.

Figure 2: Substitution pattern between LC and FX deposits conditional on income per capita



Note: The figure shows the estimated joint probabilities Here, we plotted the median of probabilities to choose "LC deposits only" ($Prob(y_1 = 1 \cap y_2 = 0)$), "FX deposits only" ($Prob(y_1 = 0 \cap y_2 = 1)$), "no deposits" ($Prob(y_1 = 0 \cap y_2 = 0)$), "both deposits" ($Prob(y_1 = 1 \cap y_2 = 1)$), respectively.

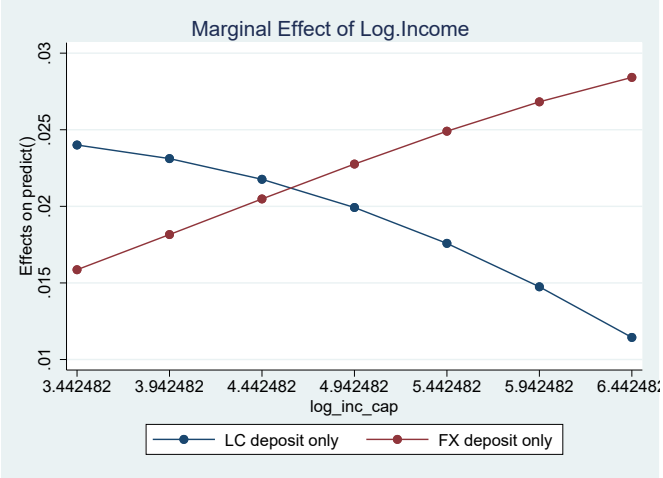
Figure 2 shows the estimated joint probabilities. First, we find that FX deposits are more income-elastic than LC deposits. Second, the probability of choosing LC deposits tends to increase with income per capita, up to the 80th percentile (corresponding to 365 USD), then it

stagnates, while from this point, the probabilities to deposit in FX and both currencies strongly increased. Thus, this shows that households start to substitute FX deposits for LC deposits from this threshold, conforming to previous studies that the level of dollarization increases if financial access increases for households with higher incomes.

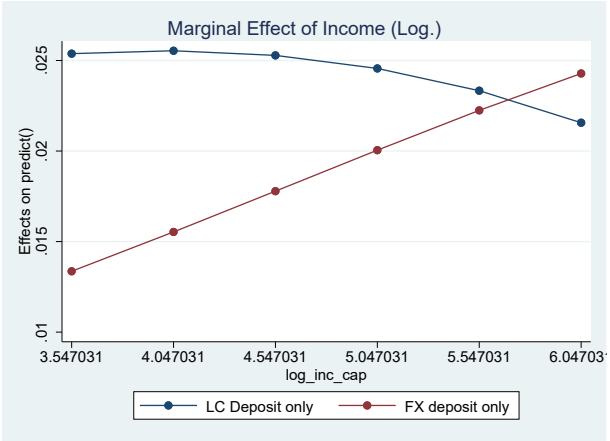
We also calculate the marginal effects of log. income per capita across different income levels in Figure 3. Here, we present the marginal effects of log. income per capita across different levels of income. Specifically, we calculate the marginal effects for each 0.5 interval from the 5% quantile to 95% of income distribution of the sample. Panel A shows the results for the full sample, and Panel B and Panel C shows the results for sub-sample of rural and urban households, respectively.

We find that the marginal effect of log. income is different across the income levels of households and between rural and urban areas, and further that the marginal effects are different between FX and LC deposits. In FX deposits, the marginal effect of log. income increases as income level grows, while it decreases as income level is larger in LC deposits. Thus, although an increase in income level facilitates financial access to both LC and FX deposits, the marginal effect of log. income is likely to be larger in LC deposits than in FX deposits for lower-income households, suggesting that an increase in income level would lead to promotion of LC deposit especially for lower-income households. In addition, the marginal effects of log. income on LC deposits outperformed those on FX deposits in rural areas. Again, the results suggest that an increase in the income of rural households would facilitate financial access to LC deposits more than FX deposits. All in all, the results suggest that financial inclusion in rural areas through the improvement of economic conditions of rural and lower households would lead to more LC deposits in Cambodia.

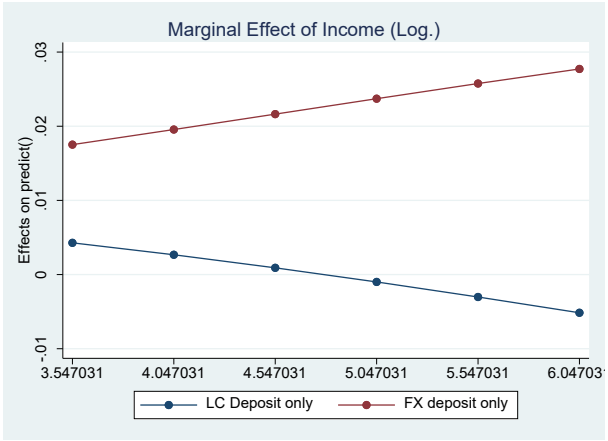
Figure 3: Marginal Effects on having FX and LC deposit across income levels



Panel A: Full sample



Panel B: Sub-sample of rural households



Panel C: Sub-sample of urban households

Note: The figures show the estimated marginal effects of changes in income for each quantiles of income distributions. Panel A shows estimated results with the full sample. Panel B shows estimated results with the sub-sample of rural households, and Panal C shows estimated results with the sub-sample of urban households.

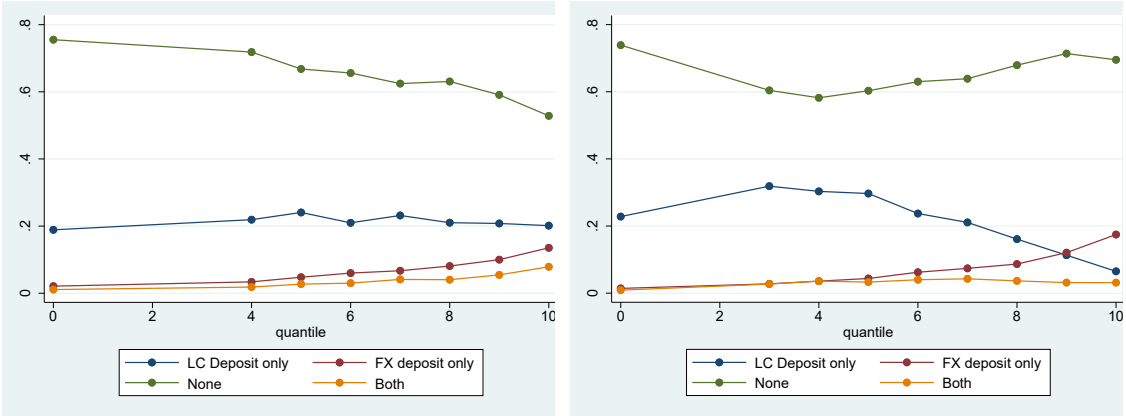
4.4 The role of FX in household expenditure/income and the substitution pattern between LC and FX deposits

In Table 6, we show that the ratio of FX in household expenditures does not encourage households to save less in LC, meaning that they do not engage in risk-hedging behavior by adjusting the currency choice in assets to currency use in expenditure. In the meantime, we found that households are likely to choose the same currency in deposits as the currency in their income. We further explore these results by plotting the probability of choosing a particular currency in deposit with the ratio of FX in household expenditure, divided into ten groups (a ratio lower than 10 percent, between 10 and 20%, …, more than 90%), and we calculate the median of probabilities in each groups to choose only LC deposits ($\boldsymbol{Prob(y_1 = 1 \cap y_2 = 0)}$), only FX deposits ($\boldsymbol{Prob(y_1 = 0 \cap y_2 = 1)}$), or o deposits ($\boldsymbol{Prob(y_1 = 0 \cap y_2 = 0)}$), both deposits ($\boldsymbol{Prob(y_1 = 1 \cap y_2 = 1)}$), respectively.

Figure 4 shows the substitution pattern across different levels of FX expenditure ratio in Panel A and across different levels of FX income ratio in Panel B. We find that the probability that households LC deposits do not significantly vary across levels of FX expenditure, while the probability of FX deposit increases as the FX expenditure ratio increases, and the increases is sharp when the FX expenditure ratio becomes more than 70% in FX. This suggests that FX deposits do not perfectly substitute for LC deposits even though households mainly use foreign currency in their daily lives.

In Panel B, we find that the probability of having LC deposits sharply decreases, and the probability of having FX deposit also sharply increases, as the FX income ratio increases. As a result, the probability of having no deposits does not change across the levels of FX income ratio. It suggests that the substitution rate is high between LC deposits and FX deposits with regard to changes in the FX income ratio. As found in Table 6 and 7, this result confirms that the currency choice in deposits is associated with the currency composition of income rather than expenditure. This implies that discouraging foreign currency wage payments would reduce financial dollarization in the deposits of financial institutions.

Figure 4: Substitution pattern between LC, FX and both deposits conditional on FX in expenditure/income



Panel A: The ratio of FX expenditure to total expenditure

Panel B: The ratio of FX income to total income

Note: The figure shows the estimated joint probabilities Here, we plotted the median of probabilities to choose "LC deposits only" ($Prob(y_1 = 1 \cap y_2 = 0)$), "FX deposits only" ($Prob(y_1 = 0 \cap y_2 = 1)$), "no deposits" ($Prob(y_1 = 0 \cap y_2 = 0)$), "both deposits" ($Prob(y_1 = 1 \cap y_2 = 1)$), respectively.There are many zeros in FX income/expenditure ratio. Thus, FX income ratio in 0% - 30% take zeros, and FX expenditure ratio in 0% - 20% take zeros.

5. Conclusion and Policy Implications

This paper investigates the factors behind having FX and LC deposits among households in Cambodia, using a nationally representative survey conducted by NBC and JICA RI in 2017. Our paper contributes to the literature in several ways. First, we provide micro-evidence of having FX deposits. Second, we apply the bivariate Probit model to take into account the financial access and asset diversification of households, given that many Cambodians do not have financial deposits and some households deposit their money in both currencies. Our empirical analysis advances the debate on financial dollarization by considering the factors behind household behavior.

Our empirical analysis revealed that the portfolio selection model plays only a marginal role in explaining the choice of currency in deposit in Cambodia. Most of the variables relevant to expectations of inflation and exchange rates, and the currency composition of expenditure failed to explain having deposits in foreign and local currency, respectively. Presumably, this is due to stable inflation and exchange rate in the past two decades. However, several variables in the household perception of inflation and exchange rate risks are still estimated as significant. Especially, uncertainty in inflation rates is associated to decreases in LC deposits, which suggests that stable inflation rates will increase access to LC deposit and leads to lower level of dollarization. Similarly, the uncertainty of exchange rate was associated to decreases in FX

deposits and increases in LC deposits. The results imply that, in order to induce households to have more LC deposits, the exchange rate should be more flexible, but should appreciate for local currency, as we found that households who expect a depreciation of LC are more likely to have deposits in FX. However, this policy must be implemented with caution as the appreciation of LC can also hurt the country's competitiveness by making export products more expensive. Hence, complementary policies need to be introduced such as production and trade policy seeking to increase labor productivity. Meanwhile, promoting financial literacy among households could be also vital to encourage them to possess more risk-hedging behaviors, and better understand or have a rational expectation on future inflation and exchange rates.

Next, we found that currency choice for deposits is strongly influenced by currency composition of the income stream, rather than the currency composition of expenditure. This suggests that households do not engage in risk-hedging by adjusting deposit currency to the currency used in their expenditure, but they rather choose the same currency in deposits as the currency in income. Presumably, due to the long-lasting stable exchange rate, households might not expect risks in exchange rate changes to be high and feel that reducing such risks via currency conversion could be more costly. Or it could be due to the lower financial literacy of Cambodian households. Either way, the results suggest that encouraging the private sector to gradually pay wages in local currency is vital to reduce the financial dollarization of deposits. Similarly, we also found that households in Phnom Penh and Siem Reap, major cities in Cambodia, tend to deposit their money in FX rather than LC. Siem Reap and Phnom Penh are the cities where tourism and FDI are concentrated, and foreign currency is widely circulating. Thus, households in those areas are exposed to USD usage much more than in other areas, leading to more FX deposits. Hence, for the promotion of LC deposit and discouragement of FX deposits, measures aiming at encouraging investors and foreign tourists to use local currency is required. For example, charging of entrance fees at tourism attractions should be in local currency only, and regulations to encourage investors to use local currency in their investments in Cambodia should be considered. Furthermore, tourists have used foreign currency for all expenses in almost all places without converting it to national currency, hence, the government should encourage and make it easy for tourists to obtain local currency for their expenses at all tourist sites. Related to this issue, regulations to encourage pricing in local currency only is also important to weaken the network externality of dollarization.

In contrast to previous studies, we found that younger cohorts are less likely to have LC deposits than older cohorts. Thus, campaigns to promote the awareness of young people towards the importance of using LC are crucial.[5]

Lastly, regarding financial access, we found that education and financial literacy strongly promote access to finance, while households in rural areas are less likely to have financial deposits. Thus, expanding and improving educational and financial services to rural areas are essential to promote the financial inclusion, which is a condition to support inclusive growth.

We believe that our analysis provides several important insights for policymakers in dollarized economies to stabilize and promote the use of local currency in the financial sector. However, our analysis still has some limitations. First, it deals poorly with endogeneity bias in the estimation. Although it is natural to assume that access to deposits has reverse causality on several explanatory variables, such as income currency, income levels, ages and household sizes, there could be reverse causality in some explanatory variables of the expectation of future inflation and exchange rates, and currency use in expenditure. For example, households having LC might start to think positively about the future value of local currency. In addition, households with LC deposits will use more local currency by withdrawing money from deposits. Thus, further analysis is required to examine the robustness of our results by developing the empirical model to treat some variables as endogenous. However, such advanced analysis requires data generated through experimental design or natural experiments. Our current study did not deal with such issues.

[5] In this sense, the monetary museum, established by the NBC in April 2019, will play a key role. By cooperating with schools, from primary to university, organizing students' visits to the museum is a good way to enhance awareness of and trust in local currency. The NBC also implements a promotion activity which is called as "I love Riel" campaign, for fostering the awareness of local currency in rural areas of Cambodia.

References

Aiba, D., K. Odajima, and V. Khou. 2018. "Foreign currency borrowing and risk-hedging behavior: Evidence from Cambodian households." *Journal of Asian Economics* 58: 19-35.

Aiba, D., and H. Okuda. 2021. "The Cost Efficiency of Cambodian Commercial Banks: A Stochastic Frontier Analysis." *Singapore Economic Review* 1-20. https://doi.org/10.1142/S0217590821500673

Aiba, Daiju, and Pagna Sok. 2017. "Financial Dollarization: Evidence from a Survey on Branches of Cambodian Financial Institutions." *Hitsubashi Economics (Hititshubashi Keizaigaku)* 10 (2): 81–116.

Basso, Henrique S., Oscar Calvo-Gonzalez, and Marius Jurgilas. 2011. "Financial Dollarization: The Role of Foreign-Owned Banks and Interest Rates." *Journal of Banking and Finance* 35 (4): 794–806.

Beckmann, E., and H. Stix. 2015. "Foreign currency borrowing and knowledge about exchange rate risk." *Journal of Economic Behavior and Organization* 112: 1-16.

Brown, M., and H. Stix. 2014. "The Euroization of Bank Deposits in Eastern Europe." *Economic Policy* 30 (81): 95-139.

Calderone, M., N. Fiala, F. Mulaj, S. Sadhu, and L. Sarr. 2018. "Financial education and savings behavior: Evidence from a randomized experiment among low-income clients of branchless banking in India." *Economic Development and Cultural Change* 66 (4): 793-825.

Cameron, A. C., and P. K. Trivedi. 2005. *Microeconometrics: methods and applications*. Cambridge: Cambridge University Press.

Eugenio-Martin, J. L., and J. A. Campos-Soria. 2011. "Income and the substitution pattern between domestic and international tourism demand." *Applied Economics* 43 (20): 2519-531.

Delechat, C., C. H. Arbelaez, M. P. S. Muthoora, and S. Vtyurina. 2012. *The determinants of banks' liquidity buffers in Central America*. IMF Working Paper No. 12-301. Washington DC: International Monetary Fund.

Fidrmuc, J., M. Hake, and H. Stix. 2013. "Households' foreign currency borrowing in Central and Eastern Europe." *Journal of Banking and Finance* 37 (6): 1880-97.

Grohmann, A., T. Klühs, and L. Menkhoff. 2018. "Does financial literacy improve financial inclusion? Cross country evidence." *World Development* 111: 84-96.

IMF. 2019. *IMF Country Report No. 19/387*. Washington DC: International Monetary Fund.

Ize, A., and E. L. Yeyagi. 2003. "Financial Dollarization." *Journal of International Economics* 59: 323-47.

Ize, A., and E. L. Yeyagi. 2006. *Financial de-dollarization: is it for real? In Financial Dollarization* (pp. 38-63). London: Palgrave Macmillan.

Krupkina, Anna, and Alexey Ponomarenko. "Deposit Dollarization in Emerging Markets: Modelling the Hysteresis Effect." *Journal of Economics and Finance* 41, no. 4 (October 1, 2017): 794–805. https://doi.org/10.1007/s12197-016-9379-1.

Luca, A., and I. Petrova. 2008. "What drives credit dollarization in transition economies?" *Journal of Banking and Finance* 32 (5): 858-69.

Menon, J. 2008. "Cambodia's Persistent Dollarization: Causes and Policy Options." *ASEAN Economic Bulletin* 25 (2): 228-37.

Odajima, K., and Aiba, D. 2019. "Dollarization in Cambodia: A Review of Recent Empirical Findings from a Nation-Wide Survey." *Asian Studies (Aziya Kenkyu)* 65 (1): 24-44.

Odajima, K., D. Aiba, and V. Khou. 2019. *Currency Choice in Domestic Transactions by Cambodian Households: The Importance of Transaction Size and Network Externalities*. JICA-RI Working Paper 185. Tokyo: JICA.

Okuda, H., and D. Aiba. 2018. "Capital structure decisions in a highly dollarized economy: Evidence from Cambodian firms" *Journal of Asian Economics* 58: 1-18.

Samreth, S., and H. Okuda. 2019. "Economic Growth and Dollarization in Cambodia." *Asian Studies (Aziya Kenkyu*) 65 (1): 61-78.

Scheiber, T., and J. Wörz. 2018. "How are reduced interest rate differentials affecting euroization in Southeastern Europe? Evidence from the OeNB Euro Survey." *Focus on European Economic Integration* 1: 48-60.

Stix, H. (2011) "Euroization: What Factors Drive Its Persistence? Household Data Evidence for Croatia, Slovenia and Slovakia." *Applied Economics* 43, no. 21: 2689–704. https://doi.org/10.1080/00036840903357413.

Stix, H. (2013) "Why Do People Save in Cash? Distrust, Memories of Banking Crises, Weak Institutions and Dollarization." *Journal of Banking & Finance* 37, no. 11: 4087–106. https://doi.org/10.1016/j.jbankfin.2013.07.015.

Uribe, M. 1997. "Hysteresis in a simple model of currency substitution." *Journal of Monetary Economics* 40 (1): 185-202.

Valev, N. T. 2010. "The hysteresis of currency substitution: Currency risk vs. network externalities." *Journal of International Money and Finance* 29 (2): 224-35.

Temesvary, J. 2016. "The drivers of foreign currency‐based banking in Central and Eastern Europe." *Economics of Transition* 24 (2): 233-57.

Yoshino, N., P. J. Morgan, and L. Q. Trinh. 2017. *Financial literacy in Japan: Determinants and impacts* (796). ADBI Working Paper Series 796. Tokyo: Asian Development Bank Institute.

Zins, A., and L. Weill. 2016. "The determinants of financial inclusion in Africa." *Review of Development Finance* 6 (1): 46-57.

Abstract (in Japanese)

要　約

預金のドル化は、開発途上国で長く継続して見られる現象である。 本稿では、2017 年にカンボジア国立銀行（NBC）と JICA 研究所（当時）によって実施されたカンボジアの家計調査のデータを使用して、家計の自国通貨と外国通貨それぞれに対する預金行動の要因を考察した。本稿では、途上国でのドル化の重要な側面として、自国通貨預金と外国通貨預金の選択と金融アクセスとの相関関係を考慮した預金の通貨選択の実証アプローチを開発し、金融のドル化の説明によく使用されるポートフォリオ選択モデルが、カンボジアの家計のデータに適合するかどうかを検証した。その結果、ポートフォリオ選択モデルがカンボジアの預金通貨の選択をうまく説明しきれないことを確認した。しかし、家計のインフレ率と為替レートに対する期待、および現地通貨の減価予想と預金の通貨選択の間には相関があることがわかった。これは、安定したインフレ率は、現地通貨での預金行動を促進することを示唆している。

さらに、所得水準の上昇は、自国通貨と外国通貨の両方の通貨での預金行動の増加と関連しているが、収入の増加の限界効果は、農村地域あるいは低所得世帯の自国通貨の預金行動に対してより大きくなっていることがわかった。 この結果は、農村地域の経済発展を促進することによる金融包摂が、現地通貨での預金の促進を促進することを示唆している。さらに、中央および東ヨーロッパ諸国からの先行研究の結果とは対照的に、カンボジアでは若年齢のコホートは年配のコホートよりも現地通貨の預金をもっている可能性が低いことがわかった。したがって、自国通貨を促進するには、自国通貨を使用することの重要性に対する若者の認識を促進することを目的とした政策が重要であると考えられる。

キーワード: ドル化、金融包摂、外国通貨預金、家計行動、二項プロビットモデル