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Empirical Study on the Promotion of Home Currency in Cambodia

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# Foreign Currency Borrowing and Risk-Hedging Behavior: Evidence from a Household Survey in Cambodia

Daiju Aiba<sup>\*</sup>, Ken Odajima<sup>\*\*</sup>, and Vouthy Khou<sup>\*\*\*</sup>

## Abstract

Foreign currency borrowing, a phenomenon sometimes referred to as *financial dollarization*, is a growing issue in developing countries. This study investigated the determinants of foreign currency borrowing behavior of households in Cambodia using household survey data; and this allowed use of the currency-wise information in tracking households' financial activities. We found that Cambodian households engage in risk-hedging behavior against exchange rate risks, and are likely to borrow in a foreign currency if this makes up the major portion of their income stream. We also found that expectation of a depreciation of their local currency leads households to take out local currency loans in line with the predictions of theoretical models. Furthermore, education plays a role in the choice of currency for loans; the better educated households are more likely to engage in risk-hedging behavior, and to seek to match the currency composition between loans and income, than the lesser educated are. We also found that variables related to the use of financial services are also positively correlated with the intensity of risk-hedging behavior against currency mismatches. These results suggest that financial literacy has the potential to enhance risk-hedging behavior against exchange rate risks for Cambodian households.

**Keywords:** Foreign currency borrowing, Dollarization, Risk-hedging behaviors, Financial literacy, Household survey

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## 1. Introduction

Given the increasing globalization in recent years, dollarization<sup>1</sup> has been one of the growing issues for developing and emerging countries. In general, dollarization may limit the range of effective monetary policy and impose serious problems on an economy and its financial sectors, although it might also attract capital inflows, and facilitate high levels of openness by eliminating exchange rate risks (Levy-Yeyati 2006; Ranciere et al. 2010; Brown, Kirschenmann, and Ongena 2014; World Bank 2015).

Among the already affected economies, Cambodia is exceptionally heavily dollarized. Cambodia has been dollarized since it started to recover from historical turmoil, and transited from a centrally planned economy to a market-oriented one in the early 1990s. According to the World Bank (2015), the ratio of US dollar deposits to the commercial bank's total deposits has ranged from 92% to 98% over the last 20 years. But not only the deposit side is highly dollarized in Cambodia, so too is the loan side, According to the data provided by National Bank of Cambodia (NBC), as of June 2013 about 99 % of the loans provided by the commercial banks are denominated in US dollars. In addition to the US dollar, other foreign currencies, such as the Thai baht and the Vietnamese dong, are also used for means of payment or as a store of value in areas near the borders with these countries (NBC 2012). Menon (2008) and Duma (2011) found that the recent growth rates of local currency deposits has been as high as those of foreign exchange (FX) deposits, suggesting that the current dollarization in Cambodia is unique, and not the consequence of currency substitutions, but is possibly caused by a massive inflow of foreign currency through foreign direct investments, bank and money market flows, and overseas development aid. However, there is currently no study which has investigated the choice of currency in the economic and financial activities of economic agents at micro levels in Cambodia. Thus, the actual situation of Cambodian dollarization at the micro level is still unclear, which makes it difficult to implement specific administrative measures to control this situation.

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<sup>1</sup> The term "dollarization" is used in a broad sense, and includes the substitution of local currency by any foreign currency in terms of store value, payment, and unit of account.

This paper investigates the factors behind FX borrowing by households. In the context of Cambodia, loans are more common financial products than deposits for households. According to the World Bank's Global Findex, only 4% of Cambodian households had formal savings as of 2014, while 28% had formal loans.<sup>2</sup> However, this might reflect recent developments in microfinance institutions (MFIs) that aim at extending loans to the poor rather than collecting deposits. Therefore, although currency choice in relation to deposits is also an important aide to the understanding of the dollarization mechanism in Cambodia; currency choices in borrowing have more implications for monetary policies and regulations on the financial sector. Furthermore, when significant exchange rate fluctuations occur, unhedged borrowers may default, and this would lead to deterioration in the financial soundness of commercial banks and MFIs. However, despite its suggested importance, there is little knowledge about the motivations and characteristics of households engaged in FX borrowing.

Collected through a unique and comprehensive micro survey, data on household economic and financial activities were examined to determine the relationship between household characteristics and the currency denomination of their loans. To do this, a Probit model of household choice of loan currency was constructed. The data was collected by the JICA Research Institute (JICA-RI) and the National Bank of Cambodia (NBC) in the period October 2014 to January 2015, and allows use of the currency composition and actual amounts of households' financial and economic variables, including income, expenditure, savings, and loans. Most previous studies have investigated the factors behind dollarization using macro-level aggregated data, and even when investigating dollarization in relation to the behavior of economic agents, macro-aggregated data have been used due to the limited availability of survey-based micro data. In contrast to aggregated data, micro data is suitable for researchers when analyzing the behavior of economic agents in detail, particularly when looking at the motive behind their currency choices. In recent years there has been an increase in the literature on foreign currency usage within households and firms, though most of those studies have focused on households in

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<sup>2</sup> The World Bank's Global Findex also reveals that the penetration of accounts at formal financial institutions is 22% in Cambodia. In line with those indicators, the data used in our study show that 459 out of 2,273 households had deposit accounts at formal financial institutions in 2014, while 634 households had loans. Therefore, our data is consistent with the previous surveys in terms of financial inclusion.

European countries and used micro data (Pellényi and Bilek 2009; Beer et al. 2010; Brown et al. 2011; Fidrmuc et al. 2013; Brown and Stix 2014; Beckman and Stix 2015).

In the empirical analysis, we found that Cambodian households engage in risk-hedging behavior against exchange rate changes, and are likely to borrow in a foreign currency if that currency makes up the major portion of their income stream. We also found that expectations of the depreciation of local currency leads households to take out local currency loans, in line with the predictions of the previous theoretical models developed in the portfolio view (Ize and Levy-Yetagi 2003; Jeanne 2005). Furthermore, we found that there is heterogeneity in the intensity of risk-hedging behaviors against currency mismatch risks. Education plays an important role in this, and better-educated households are more likely to engage in risk-hedging behaviors by matching the currency composition between loan and income than are less-educated ones.

This study complements the literature of dollarization by advancing evidence that Cambodian household behavior in relation to FX currency borrowing fits in the portfolio selection framework (Ize and Levy-Yetagi 2003; Jeanne 2005). We found that Cambodian households use risk-hedging behavior against exchange rate risks in their portfolios, and they also choose the currency for loans that they expect to depreciate to maximize the return on their portfolio. In the previous literature, Beer et al. (2010) argued that retail loans in FX currency are taken up by those households that seek lower interest rates and do not want to take exchange rate risks. However, our findings support the hypothesis that FX borrowing can be explained by risk-hedging behavior as one of the factors, suggesting that dollarization in Cambodian households is not necessarily caused by the type of small man carry-trade behaviors as argued by Beer et al (2010). Furthermore, by comparing our data with the results of previous studies (Fidrmuc et al. 2013), we show that the factors that are significant for European households are also important in driving Cambodian households to take FX loans. We believe that our study sheds light on future policy planning for coping with dollarized economies like Cambodia.

Our study is the first to point out and empirically demonstrate that there is heterogeneity in the intensity of risk-hedging behavior by households against currency mismatch risks. Even though some previous studies have found that there is a relationship between currency in income/assets and FX

borrowing (Fidrmuc et al. 2013), there are no studies that point to the heterogeneity in the intensity of risk-hedging behavior. In fact, some previous studies suggest that there could be different reasons to choose an FX currency aside from risk-hedging purposes. Odajima & Khou (forthcoming) studied the usage of currency by Cambodian households, and found that some households said that they chose an FX currency because they would use that currency in their transactions. In this regard, we empirically demonstrate in this study that the intensity of risk-hedging behavior against currency mismatch risks differs among households, and we found that education levels have an impact on the intensity of this behavior. Specifically, our results reveal that better-educated households are more likely to choose for a loan the currency that makes up the larger proportion of their income, while less-educated households choose for a loan the currency used more for the purchase of goods, rather than that which dominates income or savings. Furthermore, our study is the first to address the question of how the dollarization of transactions affects loan dollarization, and to point out that this is the consequence of non-risk-hedging behavior against exchange rate risks by less-educated households.

Our findings also complement the literature of FX currency borrowing and financial literacy developed by Beckman and Stix (2015). Beckman and Stix argued that expectation of depreciation is more important in determining the currency preferred in loan transactions if households are financially literate, and they give empirical evidence relating to European households. As well as noting the expectation of depreciation, our study shows that household risk-hedging behavior in terms of currency mismatch risks are also enhanced by levels of education attainment, a characteristic that is likely to be correlated with financial literacy.<sup>3</sup> Our results therefore suggest that knowledge of exchange rate risks or risk-hedging against these risks, i.e. financial literacy; might be an important factor in explaining choice of currency for loans by households. We also conducted robustness checks on the potential effect of financial literacy. We found that the variables relating to the importance of financial literacy are also significantly associated with the intensity of risk-hedging behavior.

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<sup>3</sup> In a recent study of financial literacy, Potrich et al. (2015) found that education is one of the major factors determining the level of financial literacy.

The rest of this paper is structured as follows: Section 2 presents the institutional background of Cambodian dollarization. In Section 3, borrowed from previous literature, we describe and develop possible hypotheses relating to household foreign currency borrowing behavior. We describe the data we used in the empirical analysis contained in Section 4. Section 5 explains the empirical strategy used to test our hypotheses, and Section 6 presents and discusses the results. In Section 7, we present our conclusions.

## **2. Institutional Background**

In the civil war period 1970–75, Cambodia had its first experience with limited dollarization during the Lon Nol regime (1970–1975), as increases in US military personnel and assistance brought US dollars into the country (De Zamaroczy and Sa 2002). When the civil war ended in April 1975, the Khmer Rouge regime introduced an extreme revolutionary program, including bans on banking and on local currency. The central bank was closed and the country’s financial infrastructure completely destroyed. Once the Khmer Rouge regime was overthrown in 1979, the central bank was re-established and local currency reintroduced (March 1980). However, USD started to flow into the country in the mid-1980s, as the United Nations (UN) dispatched humanitarian and emergency aid, international non-governmental organizations (NGOs) were allowed to operate, and remittances from abroad resumed. Lack of confidence in the local currency, hyperinflation, and a massive exchange devaluation of the KHR against the dollar during 1988–1991, pushed the public to sell their KHR-denominated assets in exchange for gold and USD (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, into the country. This was mostly spent for rent and local services for its peacekeeping operations (De Zamaroczy and Sa 2002). At the same time, FX deposits became an important component in the banking systems deposit base (Rumbaugh et al. 2000).



Currently, Cambodia has a relatively free regulatory framework for capital transactions. In fact, Article 5 of the 1997 Law on Foreign Exchange, stipulates that there shall be no restrictions on foreign exchange operations, including purchases and sales of foreign exchange on the foreign exchange market, transfers, all kinds of international settlements, and capital flows in foreign or domestic currency. In fact, households are able to open deposit accounts and borrow in three currencies (KHR, USD, and THB) from commercial banks or micro finance institutions. Measured as the ratio of FX deposits in the banking sector to broad money, dollarization in Cambodia has risen continuously from about 60 percent in the late 1990s to 83 percent in 2014 (NBC, 2015). The country's financial system depends on FX currency, particularly on USD. As of June 2013, 95.8 percent of deposits in the banking sector were denominated in foreign currencies, and 98.7 percent of loans were in foreign currencies.<sup>4</sup> These figures are exceptionally high, even compared to other dollarized/euroized economies. According to Basso et al (2011), average shares of FX loans and deposits between 2000 and 2006 in 24 European transition economies were 47% and 44%, respectively.<sup>5</sup>

In Cambodia, foreign currencies are widely used, not only in the financial system but also as a means of payment for goods and services. Cambodian households use either local or foreign currency depending on the types of products or services. Khou (2012) conducted a survey on households, and found that people used currencies differently depending on each situation. When respondents were asked about what currency they used for daily expenses, 66.4% of them responded that they used only KHR. A quarter of the respondents spent in USD in combination with other currencies including KHR. For large transactions he found that 46.9% of the respondents use only USD, while only 32.4% of them use KHR. This multicurrency usage is also confirmed by Odajima & Khou (forthcoming), who investigated the currency usage of Cambodian households using the data collected in a large-scale

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<sup>4</sup> Data provided by the National Bank of Cambodia; the authors calculated the ratio of FX deposits and loans. The data are from the balance sheets of individual 33 commercial banks and 7 specialized banks, as at June 2013.

<sup>5</sup> These 24 transition economies are Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Belarus, Serbia and Monte Negro, Czech Republic, Estonia, Georgia, Hungary, Croatia, Kazakhstan, Lithuania, Latvia, Moldova, FYR Makedonia, Poland, Romania, Russia, Slovenia, Slovakia, Tajikistan, Ukraine.

survey. For small daily transactions, Odajima & Khou (forthcoming) found that using foreign currencies does not seem to be a major method of payment, while households tend to use foreign currencies for large transactions. The author concluded that the results might reflect network externalities in the choice of currency for payments, as Valev (2010) empirically showed in Bulgaria.<sup>6</sup>

Table 1. Exchange rates (KHR/USD), Interest rate differentials, and Inflation over five years

In the period of our study macroeconomic conditions have been stable for Cambodia. Table 1 indicates that the exchange rate KHR to USD has been stable at around 4,000 KHR per dollar, with a fluctuation of 2% over the past five years, and inflation has been below 5%. There have been interest rate differentials between KHR and USD loans, and these have been about 4.5% over the past five years. However, given the inflation rate, the interest differentials between loans in USD and in KHR in real term might not be significant. Moreover, realized interest rates are affected by types of loan products and the characteristics of borrowers, such as income level and availability of collateral. It is also possible that more favorable borrower characteristics could result in lower interest rates. Secured loans have lower interest rates than unsecured ones. These characteristics of USD loans may result in lower interest rates, and interest differentials might play a limited role in determining the currency choice for loan.<sup>7</sup>

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<sup>6</sup> There is a similarity between Cambodia and some of Central and Eastern European countries with respect to FX currency usage for payments. In the case of Bulgaria, the euro and the USD are still widely used for transactions (Valev 2010). Although the tax system and other payments to and from the government are legally limited to the local currency, and the level of financial dollarization is moderated, Bulgarians widely use foreign currencies to settle transactions. In Croatia, Slovenia and Slovakia, foreign currency is also used for transaction according to the result of survey done by the Oesterreichische National Bank (Stix 2011).

<sup>7</sup> This study focus on single country, thus, the impact of the interest rate differentials is essentially out of the scope of this paper.

### **3. Determinants of FX Borrowing**

#### **3.1 The Portfolio View**

We reviewed possible determinants of choice of loan currency by households in the context of Cambodia, based on previous theoretical arguments and existing evidence. In the literature of dollarization, one of the important theoretical models is the one which is proposed by Ize and Levy-Yetagi (2003). Their model is based on the assumption that economic agents are rational and have a risk-averse utility function. Given that risk and return profiles on assets and borrowings depend on currency denomination due to the exchange rate, inflation rate, and country risk premium, economic agents choose an optimal level of FX borrowings and FX assets in their portfolios. In the vein of this portfolio view within the theoretical literature on dollarization, Jeanne (2005) also shows that the economic agents with foreign currency income have an incentive to choose foreign currency loans as optimal hedging strategies. An important prediction from those models is that economic agents hedge the risk of exchange rate changes by matching currency composition between assets and liabilities or between income stream and liabilities.

If Cambodian households are risk-averse and rational, they should be engaged in risk-hedging behavior so as to reduce the risk of exchange rate changes, or other potential currency mismatch risks, related to their portfolio selection. Therefore, we expect that households would choose FX (local) currency in a loan, if FX (local) currency has larger share in income or assets (*Hypothesis 1*). Fidrmuc et al. (2013) empirically examined the relationship between foreign currency borrowing behavior and the availability of hedging instruments, such as remittances and income in a foreign currency. The authors found that the availability of those hedging instruments has a significant effect on foreign currency borrowing, and if households have one of these instruments they are more likely to borrow in a foreign currency.

Another important prediction from Ize and Levy-Yetagi (2003) is that economic agents choose the currency which gives the higher return, *ceteris paribus*. Based on this framework, it is expected that economic agents would choose a currency for loans that is predicted to depreciate in the future, since the

repayment for the loan will decrease, so that they can increase their future return (*Hypothesis 2*). There are several empirical studies in the previous literature which support this theory. Pellenyi and Bilek (2009), for example, found that foreign currency borrowers in Hungary were likely to believe that depreciation will decrease the cost of taking out loans in the local currency. On the other hand, there is the possibility that expectations do not affect choice of loan currency. Fidrmuc et al. (2013) did not find strong evidence of any effects from expectations of depreciation on foreign currency borrowing, while Beckman and Stix (2015) found that lower financial literacy, in particular lower recognition of exchange rate risks, weakened the effect of expectations of exchange rate changes.

As will be shown later, Cambodian households are living in an environment of multiple currency co-circulation, where households receive income and hold their financial assets in multiple currencies. Thus, the value of their income or financial assets should vary as the exchange rate fluctuates. They are, therefore, inherently exposed to the risk of exchange rate changes. This environment should motivate Cambodian households to engage in risk-hedging behavior. Further, in the portfolio view, interest rate differentials between FX and local currency loans are also found to be a significant factor (Ize and Levy-Yetagi 2003). A previous empirical study confirmed that country-level interest rate differentials significantly affect a borrower's choice of currency (Fidrmuc et al. 2013). However, since the present paper only deals with a single country, the country-level interest rate differentials can be supposed to uniformly affect all borrowers in Cambodia. Thus, we do not explicitly handle interest rate differentials in the present paper.<sup>8</sup>

### **3.2 Heterogeneity in Risk-Hedging Behavior against Exchange Rate Risks**

Previous studies point out that household behavior is complicated, and theoretical models often fail to fit in real data in both developing and developed countries. Recent studies have argued that financial literacy is a key to solve the complications in household behavior (Lusardi and Mitchell 2014). Disney

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<sup>8</sup> Nevertheless, the interest rate differentials could differ among lenders and among regions even within a single country. We control for the potential effect of interest rate differentials by setting lender dummy and region dummy variables in the analysis.

and Gathergood (2013) empirically found that households with a poor understanding of the price of consumer credit are likely to have costly consumer credits. In the literature of dollarization, Beckman and Stix (2015) point out that financial literacy about exchange rate risks plays a significant role in the choice of currency in borrowing. Specifically, they argue that financially literate households are likely to behave as the theoretical model predicts. Then, they empirically demonstrate that within households which expect the depreciation of foreign currency, those with better knowledge about exchange rate risks tend to borrow in a foreign currency. Their findings suggest that lack of financial knowledge is also a determinant of choice of currency in borrowing.

We expect that financial literacy also can explain household risk hedging behavior in their choice of currency. Specifically, we formulate the hypothesis that households are more likely to choose a loan currency which has a larger share in their income or assets if their financial literacy is higher (*Hypothesis 3*). Although Beckman and Stix (2015) examined if the households that choose a currency are those that expect a higher return, our interest is whether or not Cambodian households choose a loan currency which supposed to minimize risks, and why.<sup>9</sup> Furthermore, we conjecture that, when borrowing, low literacy households would be likely to choose the currency that they use to purchase goods, rather than a currency which dominates their income or savings (*Hypothesis 4*). As we will describe later, FX currency is widely used even in payments for goods for Cambodian households. Since lower financially literate households are likely to be short-sighted and less risk-averse, their choice of currency in borrowing is possibly more linked to the currency for purchasing goods and services without considering any currency mismatch risk between income/asset and debts.

In sum, we test the following four hypotheses:

H1. Households will choose FX (local) currency in a loan, if FX (local) currency has a larger share in their income or assets;

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<sup>9</sup> In our empirical work, we also attempted to test the relationship between expectations of depreciation and financial literacy, as Beckman and Stix (2015) did. However, we found that the number of households who answered the question on future exchange rate was low in our sample, probably because in general Cambodian households are less financially literate, and there have been long-lasting stable exchange rates in Cambodia. Thus, we do not examine the differential effect of financial literacy on the expectation of the impact of depreciation in this paper.

- H2. Economic agents will choose the currency in loans which is expected to depreciate in the future;
- H3. Households are more likely to be engaged in risk-hedging behaviors if their financial literacy is high; and
- H4. Less financially literate households will likely choose a currency that they commonly use to purchase goods and services, rather than a currency that has a large share in their income streams or savings.

Our paper has an advantage over previous studies in testing household risk-hedging behavior for several reasons. First, while Fidrmuc et al. (2013) simply used a dummy variable as a proxy for having foreign currency income or not, our dataset allows us to use data on the detailed currency composition of income, financial assets, and also expenditure. Second, previous studies have mostly dealt with central and eastern European countries, where dollarization/euroization has been prevalent in households' loans and deposits, whereas dollarization is also prevalent in income and expenditure sides in the case of Cambodia. Lastly, the regulatory framework of Cambodia gives us an advantage in studying household behavior in a dollarized environment, since in fact there is no restriction on providing FX deposits and FX loans for financial institutions in Cambodia. Several European countries pose some restrictions on FX loans and FX deposits (Brown et al. 2011). Such a regulatory framework with restrictions may affect and bias borrower decisions, and make it difficult to analyze factors affecting currency choice, including the risk-hedging behaviors of other economic agents. Thus, studying the Cambodian case is suitable for testing our hypotheses on FX borrowing for households.

#### **4. Data Description**

We employ survey-based data that was collected under a joint project carried out by JICA Research Institute (JICA-RI) and the National Bank of Cambodia (NBC) from October 2014 to January 2015. In this survey, 2,273 households from all 25 provinces were sampled in a random manner.<sup>10</sup> Thus, the sample is nationally representative for Cambodian households.<sup>11</sup> The survey questionnaire covered

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<sup>10</sup> For the detail of the survey description, see Odajima and Khou (forthcoming).

<sup>11</sup> We compared the sample in our data with the sample from the Cambodia Socio-Economic Survey 2013

several economic and financial activities, such as income, expenditure, savings and borrowings, and the breakdowns of those items by currency as of the end of September 2014.<sup>12</sup> Furthermore, it included several attributes of households, such as education levels, ages of household head, and perceptions about future exchange rates.

Information on outstanding loans was covered in this survey. Out of a total of 2,273 respondents, 674 outstanding loans were identified by 634 households (about a third of all respondents). The survey data on outstanding loans covered current outstanding amounts, information on interest rates, duration, types of lenders, choices of loan currency, and the initial amount of the loan. The detailed information on outstanding loans enabled us to investigate the borrowing behavior of households at loan-level, and to find the factors relating to the choice of borrowing currency.

Table 2. Frequency of Currency Types in Outstanding Loans by Lenders

Table 2 gives the frequency of currency types in outstanding loans by lenders. We found that 210 loans (35 percent) out of a total 672 were borrowed in the Cambodian local currency, KHR. However, according to the NBC, about 95 percent of loans provided by commercial banks were denominated in USD. Thus, in contrast, our data suggests that households might be less dependent on foreign currency when borrowing. As for loan providers, 162 loans (24 percent) and 383 loans (57 percent) were granted by commercial banks and by microfinance institutions (MFIs), respectively. The remainder of the loans (19 percent) came from kinship networks (relatives/friends), NGOs, or other informal lenders. We found that more than 80 percent of households rely on formal financial institutions when borrowing money, suggesting that the formal financial system plays an important role in household finance, even though financial product development is still low in Cambodia.

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(CSES) conducted in 2013, and surveyed 3840 households. We confirmed that the 31% of the sample from the CSES had loans, which is almost consistent with the sample from our data (28% of households had loans). Thus, we suppose that the analysis using our sample is not subject to serious biases from sampling issues.

<sup>12</sup> The questionnaire is available on request.

Table 3. Breakdown of Loan Characteristics by Currencies

Table 3 gives an overview of loan characteristics, such as interest rates, amount, and maturity by currency denomination. We found that there were differences in loan characteristics. We also found that the size of loans denominated in KHR was smaller on average than those in FX currencies at the time they were granted and outstanding when interviewed. Interest rates on KHR loans were relatively high, while interest rates on FX loans were the lowest. These loan characteristics are possibly related to household characteristics, although it might also be possible that those loan characteristics could reflect risk premiums on currency exchange. It is worth noting that loan terms are a bundle of contract features that are negotiated at the same time.

Table 4. Interest Rate Differentials by Lenders

Since the theoretical and empirical literature suggests that interest rate differentials might be an important factor in choice of loan currency (Ize and Levy- Yeyati 2003; Basso et al. 2011), we assessed whether there were differences in the interest rate differentials which lenders offer. To do so, we divided our sample by types of lenders and currencies. Since we dropped ineffective samples (i.e., households who: (1) did not answer on interest rates, (2) answered that interest rates were zero, or (3) did not know the interest rate), the sample sizes are smaller than those in Table 2. In particular, regarding loans from kinship networks (Family, relatives, and friends), most households answered that they did not know, or that no interest rates were imposed. Thus, the sample size in the category of other lenders is small. Table 4 shows the results. We found that interest rate differentials differ by types of lenders. In particular, the interest rate on FX loans was lower than that on KHR loans when households borrow from commercial banks and MFIs. However, the interest rate differentials between KHR and FX loans are on average almost zero when households borrow from other lenders. This may suggest that interest rate differentials



vary across lender types within the same country. In other words, even within a country, households are offered different levels of interest rate, which differ from lender to a lender.<sup>13</sup>

These findings have implications for the construction of the empirical model presented later. In previous studies, the interest rate differential has been explicitly or implicitly assumed to be at the same level when households are living in the same country. However, it may be possible that an endogeneity problem exists due to the omitted interest rate differentials. In a later section, we control for the potential effect of interest rate differentials using dummy variables for lender types.

#### Table 5. Breakdown of Household Characteristics by Currency Choices

Furthermore, our dataset reveals the unique features of dollarization of Cambodia. In Table 5, we present the ratio of FX currencies in the savings, incomes, and expenditure patterns of Cambodian households. Importantly, although there are variations in the level of foreign currency used by households, the average ratios of FX currencies are significantly high in all household types. This suggests that dollarization in Cambodia seems quite different from what happened in central and eastern European countries (Fidirmuc et al. 2013). According to the earlier study, there were small numbers of households with FX currency incomes (Euro income) in those countries. However, Cambodian households earn money or keep their savings mainly in FX currencies. Interestingly, Cambodian households with FX loans did not completely earn their income in foreign currencies; those with KHR loans only partly earned income in FX currencies. Further, when we look at the ratio of FX currencies in savings, these are high in all types of households. More importantly, dollarization of transactions also prevails in Cambodia. The ratio of FX expenditure is around 10 percent on average. Those findings may suggest that to some extent Cambodian households are dealing with co-circulation of multiple currencies, and managing the currency composition of their portfolio on a daily basis.

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<sup>13</sup> Given interest rate differentials are implicitly set as the lenders lend money in a preferred currency, our results in interest rate differentials reflects the differences in lender funding structures. Brown and De Haas (2013) found that funding structure is a significant factor for banks when lending in FX currencies.

## 5. Empirical Methodology

To assess the general determinants of FX currency borrowing by household, we dropped households with no loans from our sample, and estimated the Probit model for borrower choice of currency in those that did. Specifically, we estimate these parameters in the following model:

$$Prob(FX\ loan_i = 1) = F(\alpha + \beta * FX\ Asset_i + \gamma * FX\ Income_i + \theta * X_i) \quad (1)$$

where:  $FX\ loan_i$  is a dummy variable and represents that household  $i$  has an outstanding foreign currency loan; while  $FX\ Asset_i$  and  $FX\ Income_i$  represent the ratio of FX financial assets to total financial assets, and the ratio of FX incomes to total income of household  $i$ , respectively; and  $X_i$  represents other household characteristics that are supposed to affect household  $i$ 's currency choice.

To examine the hypothesis that less financially literate households tend to choose a currency which they already use for purchasing goods, we extend the model to capture heterogeneity in the effects of the ratio of FX income to total income:

$$\begin{aligned} Prob(FX\ loan_i = 1) \\ = F(\alpha + \beta_i * FX\ Asset_i + \gamma_i * FX\ Income_i + \delta_i * FX\ Expenditure_i + \theta * X_i) \end{aligned} \quad (2)$$

We assume that the coefficients of the ratio of FX financial asset, FX income and FX expenditure vary across levels of financial literacy as follows:

$$\beta_i = \beta_1 + \beta_2 * Literacy_i \quad (3)$$

$$\gamma_i = \gamma_1 + \gamma_2 * Literacy_i \quad (4)$$

$$\delta_i = \delta_1 + \delta_2 * Literacy_i \quad (5)$$

where:  $Literacy_i$  represents the level of financial literacy for household  $i$ ; and in the estimation, we use interaction terms to capture the effect of financial literacy on the coefficients of  $\beta_i$ ,  $\gamma_i$  and  $\delta_i$ .

In our hypothesis, better literate households are more likely to be engaged in a risk hedging behavior. Thus, we expect  $\beta_2 > 0$ ,  $\gamma_2 > 0$ , and  $\delta_2 < 0$ , which means that  $\beta_i$  and  $\gamma_i$  are higher and  $\delta_i$  is lower for better literate households. We compare the marginal effects of those variables at means for lower financially literate households with those for higher financially literate households.

Based on models above, we examined whether Cambodian households behave in such a way that they aim to maximize their expected returns, and whether they engage in risk-hedging behavior in borrowing transactions. We tested the relationships between foreign currency borrowing and the expected value of the exchange rate in the future. We also tested whether households are engaged in risk hedging behavior by matching the currency composition of income and/or financial assets with that of loans. To test the effects of expectations for the future exchange rate changes on choice of borrowing currency, we used a quantitative measure of the respondent's perception to the question: "*In 6 months from now, what do you think the USD/KHR exchange rate will be?*" We used a dummy variable which takes the value one if the respondents answered more than 4100 KHR, and the dummy is supposed to represent depreciation in the local currency if it takes the value one.<sup>14</sup> We expected that if their expectation for the future exchange rate of the KHR to USD is to depreciate, the probability of taking out a foreign currency loan would also be higher. Presumably, this would be because any depreciation of the local currency would make it more attractive for households to take out local currency loans. However, probably in part due to the relatively stable exchange rate in Cambodia of late, the number of respondents who answered the exact value of the future exchange rate was low. Thus, we included a dummy variable which took the value one if the respondents answered "*Don't know*" to the above question. On this, Beckman and Stix (2015) found a significantly negative correlation between expectation of depreciation in the local currency, and the foreign currency borrowing behavior of households in Central and Eastern European countries.

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<sup>14</sup> The exchange rate of KHR to USD was 4076/1 at the end of October, 2014, and was 4060 /1 at the end of January, 2015.

In order to test whether the choice of foreign currency loans is a consequence of hedging behavior, we matched the currency in loans with the currency composition of the respondents' financial assets and income stream. If households wish to reduce the risk of exchange rate fluctuations on assets, they would borrow in the currency which makes up the largest part of their assets, so as to reduce the default risk. To test this hypothesis, we included the proportion of foreign currency savings to total savings, and the proportion of foreign currency income to total income in the model.<sup>15</sup> We expected positive values in the coefficients of the ratio of foreign currency in savings and in that of income streams if households are risk averse and, thus, optimize their portfolio in terms of returns and risk as predicted by the theoretical models in the portfolio view.

As well as data on the question about exchange rate changes, we found that 307 out of 634 households with loans reported that they had no savings at the time they were interviewed. To avoid reducing the sample size, we set the variable of the proportion of FX savings at zero if a household had no savings, and we included a dummy variable which took the value one if the household had no savings in relation to the explanatory variables. By doing this the respondents that had no savings could be included, and the selection bias reduced.

We used education levels as a proxy variable for the financial literacy levels of household, since the dataset does not include variables which directly measure financial literacy. Even though education level is not necessarily equivalent to financial literacy level, Lusardi and Mitchell (2014) and Beckman and Stix (2015) provide empirical evidence that financial literacy about exchange rate changes is correlated with education levels<sup>16</sup>. Thus, in our data, there is the information of education attainments of household heads. We categorized the education attainment of heads of household into two levels: a low level of education, which represents “*no schooling*,” “*primary school*”; and a high level of education, which represents households which attained “*secondary school*,” “*high school*,” “*a bachelor degree*,” or

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<sup>15</sup> Also, savings can be interpreted as the current liquid assets for payment of debt. The ratio of foreign currency income may be correlated to the currency composition of any future income stream, and can be interpreted as a proportion of the foreign currency in future assets.

<sup>16</sup> Several studies have also found that general knowledge level (educational attainments) and specific knowledge (financial literacy) both affect the financial decision (Lusardi and Mitchell 2011; Lusardi and de Bassa Scheresberg 2013).

higher. However, in some cases, respondents were not the head of the household, and answered “*Don’t know*” to the question about educational attainments of their household head. We dropped those households that answered “*Don’t know*” from the sample.

Following the previous literature on foreign currency borrowing by households, we estimated the possible effects of a household’s other demographic and economic characteristics, such as income level, age, and self-employee (business ownership) on the probability of borrowing in a foreign currency (Pellényi and Bilek 2009; Beer et al. 2010; Fidrmuc et al. 2013; Beckman and Stix 2015). We included the logarithm of total income, an older dummy variable representing whether a household head is older than 40, and a self-employee dummy variable. In order to capture the effect of types of lenders, we also included a dummy variable which took the one if a household borrowed from formal financial institutions, that is, commercial banks and MFIs. Even though previous papers emphasize country-level interest rate differentials (Fidrmuc et al. 2013), there could also be a difference in the extent of interest rate differentials among lenders. As pointed out by Basso et al. (2011), lenders could use such interest rate differentials as an instrument to give borrowers an incentive to choose a currency which lenders prefer. In other words, the lenders could encourage borrowers to choose the currency which the lenders prefer by offering lower interest rates on loans in that currency.<sup>17</sup> In Cambodia, the formal financial institutions do seem to offer lower interest rates on foreign currencies than on local currency, as seen in the earlier section. Therefore, households should be motivated, *ceteris paribus*, to borrow in foreign currencies if they borrow from formal financial institutions. Fidrmuc et al. (2013) conducted international comparative studies, and found evidence that household choice of currency is dependent on country-level interest rate differentials, however, no previous studies have considered the fact that interest differentials differ across lender types possibly because of their different funding structures. Our specification is supposed to reduce the bias associated with interest rate differentials at individual lender-level.

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<sup>17</sup> Compared to kinship networks or informal lenders, formal financial institutions collect funds from a wide range of areas inside and outside the country in the forms of deposits, borrowings, and equity. Thus, their liabilities are prone to be dominated in US dollars, and the fear of currency mismatch makes them provide loans in a foreign currency.

Since the development of financial infrastructures and the structure of major economic activities are different in urban and rural areas, their preference with regard to currency choice may be also different. We therefore also controlled for this region-specific effect by using regional dummy variables. Our regional dummies were those defined at province level in accordance to National Institute of Statistics (NIS), Cambodian national statistical office.<sup>18</sup>

## **6. Empirical Results**

### **6.1 Baseline Models**

Before we present the results concerning interaction terms with education levels, we show the results of regression without interaction terms as the baseline results, in order to observe the simple relationship between explanatory variables and the choices of loan currency, and to compare our results in Cambodia with prior studies in European countries (see Pellényi and Bilek 2009, Beer et al. 2010, Fidrmuc et al. 2013, and Beckman and Stix 2015). Table 6 gives the results of the estimated coefficients from equation (1), and presents the marginal effects of each explanatory variable at the mean value. From column (1) to (6), we present the results of various combinations of the share of FX currency in savings, income, and expenditure. In order to control for the potential residual correlation within regions, we analyzed all specifications with a clustered estimator of standard errors at province-level. We found that some of respondents reported too large amounts of total income. In the estimation, we categorized the sample at 1% of the distribution of total income to reduce the bias from outliers. This meant that the size of final sample was reduced to 617. The variables used in the regression equations are defined in Appendix 1, and the descriptive statistics and the correlation matrix are reported in Appendix 2 and 3, respectively.

Table 6. Estimation Results of Baseline Models

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<sup>18</sup> There are four administrative division levels in Cambodia: the province, district, commune, and village levels. Provinces are first-level administrative divisions in Cambodia, and as of the end of 2014, there were 25 provinces.

First, we found that the ratio of FX currency in income is statistically significantly associated with the likelihood of borrowing in a foreign currency. This result supports the hypothesis that households are likely to match the currency composition of loans with their assets and income stream for risk-hedging against exchange rate risks (*Hypothesis 1*). However, the statistical significance of the ratio of FX savings disappeared in column 6 (Table 6). This may suggest that, rather than augment the currency of their savings, households are likely to borrow in a currency which has a large share of their income stream. Given most households in Cambodia are relatively poor, it might therefore be more important to adjust the loan currency to the currency of their income stream than that of their current financial assets. Or we might interpret this pattern as being that households with outstanding loans do not have high levels of savings, so they are not able to use this as an effective hedging measure for loans. These households borrow money because of a shortage of normal financial assets.

We next found that their expectation of depreciation in the local currency is significantly negative in all specifications, except as in column 1. The results in general are in line with the hypothesis of the portfolio view (*Hypothesis 2*), and confirm the previous empirical findings by Beckman and Stix (2015). Note that the model in column 1 lacks significant variables, such as ratios of income and expenditure, which might reduce the significance of the expectation of depreciation in column 1. The results in column 2-6 mean that households tend to take out local currency loans if they expect the exchange rates of KHR/USD to rise in the future. These results are also in line with the hypotheses of the portfolio view (*Hypothesis 2*), and are in line with the previous empirical findings by Beckman and Stix (2015). This may suggest that Cambodian households are quite economically rational, and choose the currency in which they borrow to maximize future returns on their portfolio. In other words, the conventional theoretical model also fits in the borrowing behaviors of Cambodian households. Furthermore, the economic impact of the expectation of depreciation is also large. If households expect depreciation in the future, the likelihood of borrowing in foreign currency decreases by around 20%. This result also indicates that the expectation of exchange rates is a significant factor in the explanation of loan dollarization in the household sector.

The use ratio of FX currency in expenditure was also statistically significant, and positively correlated with the choice of a loan currency (column 3, 5 and 6). The results are in line with those of Fidrmuc et al. (2013), and Beckman and Stix (2015).<sup>19</sup> Interestingly though, this result cannot be explained by the theoretical models in the portfolio view. Apart from risk-hedging behaviors and expectation of depreciation, the currency which they use for purchase of goods is also a significant factor in explaining household behaviors in relation to FX borrowing.

Regarding other dependent variables, the logarithm of total income is significantly positive in all specifications, and the economic impact of change in this variable is strong. We found that a standard-deviation increase in this variable (1.125) leads to about a 9-percentage-point increase in the likelihood of taking out foreign currency loans. The results suggest that income level is crucial when explaining foreign currency borrowing. In the case of other countries, Fidrmuc et al. (2013) did not find a significant correlation between income levels and FX borrowing in the EU or weakly euroized countries, but they found a strong correlation in non-EU or strongly euroized countries. Cambodia is a strongly dollarized country, and our finding is therefore in line with Fidrmuc et al. (2013). Since euroized or non-EU countries likely have immature financial system like Cambodia's, this finding is also interesting, and may have important policy implications. Assuming that households with higher income levels generally borrow larger amounts, this result might reflect that richer households choose FX currency loans to obtain large funds due to limitations on the amount of loans they are able to borrow in their local currency.<sup>20</sup> In other words, imperfections in financial markets might cause difficulties when borrowing large amounts of money in a local currency.

We also found that the dummy variable for rural areas is significant and negative in all specifications, meaning that households living in rural areas tend to choose local currencies for

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<sup>19</sup> Their variable was household perception of the usage of foreign currency in daily transactions, not the direct measure of FX expenditure of households. However, currency usage in transactions is affected by the transactions made by other households.

<sup>20</sup> Jeanne (2000) and Brown, Ongena, & Yeşin (2014) constructed a theoretical model to incorporate market imperfections by modeling information asymmetry in the currency composition of income between lender and borrowers. They demonstrated that the economic agents with local currency also have an incentive to apply for foreign currency loans to signal that they have an ability to repay debt.



transactions and loans, even if the FX shares in income, savings, or expenditures are controlled. This may suggest that differences in conditions on access to financial institutions affects household choices. Furthermore, the dummy variable for types of lenders is also significant in all specifications. This may suggest that formal financial institutions discourage borrowers from taking out local currency loans, possibly by offering higher interest rates or by setting other disadvantages in local currency loans.

## **6.2 Effects of Financial Literacy on Borrowing Behaviors**

From the baseline models above, we confirmed that the currency composition of incomes and expenditures are both significant factors in explaining the choice of a loan currency. However, why is loan currency also linked to the currency used in the purchase of goods? Risk-hedging behavior against exchange rate risks cannot explain this linkage. Thus, we argue that the results might reflect that there are both households who manage to deal with currency mismatch risk, and those who do not engage in risk-hedging, in Cambodia. In other words, these results might come from the heterogeneity across households, in particular, across levels of financial knowledge. To further investigate household behavior in this area, we examined two hypotheses as described earlier: (1) households with better financial literacy will be more likely to engage in risk-hedging behavior (*Hypothesis 3*); and (2) households with less financial literacy will be more likely to choose a loan currency that they already commonly use for the purchase of goods (*Hypothesis 4*).

To examine these hypotheses, we estimated equation (2) using education-level dummy variables for higher education level as a proxy for better financially literate households. In Table 7, we present the estimated marginal effect of each explanatory variable at mean value. For the ratios of FX currency in savings, income, and expenditure, we present the marginal effects when the dummy variable for education level is 0 (low level) and 1 (high level), respectively, and other explanatory variables are at their mean values. As well as these baseline models, in order to control a potential residual correlation within regions, we estimated all specifications with a clustered estimator of standard errors at provincial levels. Since our assumption is that financial literacy indirectly affects borrowing behavior by affecting the intensity of currency marching behavior, our preferred results are found in column 1-3, and only

include the interaction terms relating to education levels. These data do not include a dummy variable for education level itself. However, in the last three columns (column 4-6) of table 7, we present results which include a dummy variable for education in the regression matrix. We confirm that the statistical significance of the results does not change even if we include the education dummy variable itself, and that the direct effects of education level are not robust. In addition to these baseline results, we winsorized the sample at 1 % of the distribution of total income, to reduce any bias from outliers before running the regression analysis.

Table 7. Estimation Results with Interaction Terms of Education Levels

Interestingly, we found that the effect of the ratio of FX income on risk hedging behavior is different for low and high education levels. In the case of column 1, the marginal effect of the ratio of FX income for households with low education level is not significant, and is much lower than that for households with high education level. Furthermore, in all specification, the estimated marginal effects of the ratio of FX income for the more educated are higher than those for the less educated. This means that financially literate households tend to choose the currency of loans to match the currency composition of their income stream, while lower financially literate households do not behave in this way. These results are in line with our hypothesis that financially literate households are more likely to engage in risk-hedging behaviors against exchange rate risks (*Hypothesis 3*). However, the ratio of FX savings is not significant in all specifications, suggesting that even well-educated Cambodian households would rather adjust currency of loans with income streams.

Similarly, we found that the effect of the ratio of FX expenditure on risk-hedging behavior is also dependent on education levels. The marginal effects of the ratio of FX expenditure are lower for the households with high education levels. Given the results for the ratio of FX income, better educated households are more likely to engage in risk-hedging behavior, and will choose a loan currency to reduce the risk of exchange rate changes in their portfolio, while the less financially literate are less likely hedge the risk, and choose the loan currency they commonly use for purchasing goods. We found

the same results in every specification in Table 7 regarding both FX income and expenditure ratios. In all, these results support our hypothesis that less educated households are likely to be short-sighted, and choose the currency which they use for purchasing goods (*Hypothesis 4*). They may also imply that households with less education are likely to have exchange rate risks in their portfolio, which will be a problem for governments when they wish to implement de-dollarization policies, since those policies may make exchange rates more unstable.

In addition, we confirm that the significance of these coefficients do not change for the other explanatory variables compared to the expectation of baseline models. Expectation of depreciation, income levels, differences between urban and rural areas, and effects of formal lenders are thus significant factors to explain the choice of currency in loans.

### **6.3 Robustness checks of effect of financial literacy**

We found that there is heterogeneity in risk-hedging behavior against currency mismatch risks as mentioned earlier. The dummy variable for higher education, used for a proxy for level of financial literacy, is significantly and positively correlated to the degree of intensity of risk-hedging behavior. However, since some previous studies point out that education levels do not necessarily reflect financial literacy levels, we conducted a set of robustness checks using alternative proxy variables for financial literacy levels, as we do not have direct measurements of financial literacy.

It is well known that level of financial literacy affects people's usage of several financial services. Using formal financial services involve non-pecuniary barriers, such as financial literacy (Claessen 2006). Van Rooji et al. (2011) empirically demonstrated that financially literate people are more likely to participate in a stock market. In the context of developing countries, Honohan and King (2012) empirically found that financial knowledge is significantly correlated to whether a household has a bank account. Given these earlier findings, as alternative variables we used: (1) experience of borrowing in the past; (2) possession of a bank account in a financial institution; (3) experience in using formal bank transfers; or (4) possession of any type of financial assets. Detailed definitions of these variables are given in Appendix 1. We ran a regression on these specifications as shown in column (1) in

Table 7, using dummy variables for usage of these financial services instead of the dummy variable for higher education. The results are given in Table 8.

Table 8. Effect of Usage of Financial Services on Risk-Hedging Behaviors

Regarding the effect of the proxies of financial literacy on risk-hedging behavior against exchange rate risks, we found the same significant results in all specifications, as seen in Table 8. We found that borrowers with experience of using these financial services are likely to match loan currency with the currency composition of their income stream. In addition, the effect of the ratio of FX expenditures is lower for those with this experience than for those without it. We confirm that our hypotheses are also supported by use of alternative proxy variables for financial literacy (*Hypothesis 3 and 4*).

## 7. Conclusions and Policy Implications

Using survey-based data, we examined the possible factors which are thought to induce households to borrow in a foreign currency. Our study first attempted to investigate the determinants of household foreign currency borrowing behavior in Cambodia, as there have been no previous studies investigating dollarization in Asian countries at the household level. Furthermore, we used more detailed information of currency composition of households' financial activities compared to previous studies. Therefore, we believe our study provides robust results and give insights for factors behind foreign currency borrowing of households.

Since its economy started to transition from a socio-planning economy to a market-oriented one in the early 1990s, Cambodia has suffered from deep dollarization. However, dollarization in Cambodia has followed a different trend from other dollarized economies. Dollarization has been constantly growing despite recent stable macroeconomic conditions in that country. Thus, investigation of the factor of foreign currency usage in the Cambodian case is helpful to the development of

appropriate administrative measures. There is, however, a scarcity of econometric studies that investigate this dollarization, particularly through the use of micro data. We therefore believe that our study also contributes to the ability to design policy for the promotion of the use of local currency in Cambodia.

We found that Cambodian households engage in risk-hedging behavior against exchange rate changes, and are likely to borrow in foreign currency if this makes up the major portion of their income stream. We also found that expectations about the depreciation of local currency lead households to take out local currency loans in line with the predictions of the theoretical models we discussed. Furthermore, we found that there is heterogeneity in the intensity of risk-hedging behavior. In particular, we found that education level and the usage of financial literacy has significant effect on the intensity of risk-hedging behaviors. Our findings suggest that financial literacy has the potential to improve the risk-hedging behavior of Cambodian households.

From the results of our study, we can draw some policy implications on dollarization issues, and de-dollarization strategies for the household sector. Firstly, promotion of local loans should be implemented along with the promotion of wage payments in local currency. In the previous literature, Beer et al. (2010) empirically demonstrated that Hungarian households take out FX loans as the consequence of carry-trade behaviors. On contrary, our results suggest that some Cambodian households take out FX loans for the purpose of risk-hedging against their FX income. Therefore, simply having those households take out local currency loans may mean that they incur currency mismatch risks on their balance sheets. Thus, the promotion of wage payments in local currency should be made along with the promotion of local currency loans. In addition, our results also suggest that less financially literate households are likely not to take out FX loans for risk-hedging purposes, but because they need FX currency to purchase goods. Therefore, reducing FX currency in households' incomes and expenditures should lead to a shift toward local currency borrowing by households.

Secondly, governments should facilitate financial literacy during the process of de-dollarization. Our findings highlight the importance of education relating to exchange rate risks on FX currency borrowing behaviors, i.e. financial literacy. In particular, in the case of Cambodia the effect of financial

literacy seems much important. We found that better educated households are more likely to choose a loan currency for risk-hedging purposes, whereas lower educated households are not engaged in risk-hedging, and seem to make short-sighted decisions to choose a loan currency. Since it is expected that exchange rates will be more or less unstable after implementing de-dollarization measures, the lower financially literate households would likely suffer from losses due to the currency mismatch in their balance sheets. Therefore, when pursuing a policy that promotes the use of KHR in loans, it may be necessary to enhance widespread financial literacy in order to make households understand the risks associated with net open positions in the longer term. Facilitating households to manage their portfolio will help reduce the damage of de-dollarization on the economy.

Thirdly, foreign currency borrowing behavior is related to a household's expectations of future exchange rate changes. Households choose loans in an FX currency if they expect that this FX currency will depreciate, since repayments will be lower in the future. Households who provided answers on the future expected value of exchange rates are thus behaving rationally when taking out loans. Meanwhile, it may well be that the authorities should reconsider the negative effect associated with current stable exchange rates, since households tend to underestimate the exchange rate risk by using the relatively stable KHR exchange rate that hides the threats and risks of exchange rate fluctuations. It is a common phenomenon that economic agents underestimate the exchange rate risks related to foreign currency loans where local currency exchange rates are relatively stable (Fiorante 2011).

Lastly, the dollarization of transactions might affect financial dollarization. In other words, if currency choice in payments for goods shifts to foreign currency, foreign currency loans will become widespread. We argue that there is therefore a possibility that currency usage in expenditures may also be linked to the currency choice in a loan; and in the empirical analysis, we found evidence that lower educated households are likely to choose for their loan the currency that they use for the purchase of goods. Currency choices in transactions are also generally subject to network externalities, which induce the hysteresis in asset and transaction dollarization (Valve 2010; Samreth 2011). In other words, if the foreign currency is widely used and dominates the currency composition of expenditures for some households, other households also tend to use foreign currency for the payments of goods. Accordingly,

once foreign currency starts to be used in payments, the currency choice of loans will possibly become foreign currency in the banking system. This expenditure channel to loan dollarization can be another factor to explain the hysteresis of dollarization in Cambodia. However, the important implication for policy making from this is that government should reduce foreign currency in expenditures to prevent the hysteresis of loan dollarization if the education level or financial literacy level is low on the whole in a country.

However, there remain some limitations and challenges for our study. First, we used the dummy variable of education attainment as a proxy for the levels of financial literacy because of data limitations. Even though there might be a correlation among education attainments, usages of financial services, and levels of financial literacy, our results could reflect another potential effects relating to education levels apart from the effect of financial literacy. While measuring financial literacy is complicated, using direct measures of financial literacy is required to evaluate the actual effect of increment of financial literacy for policy making. Second, we could not address the endogeneity issues in the regression of actual choice of loan currency and household characteristics, as pointed out by Fidrmuc et al. (2013) and Beckman and Stix (2015). This was due to limitations on data availability in our study. Our data does not cover household preference on currency in future borrowing.<sup>21</sup> Third, we could not capture the potential borrowers in our model, in the sense that some of households might be discouraged or rejected despite their demand for loans. Some of variables relating a repayment ability or transparency, such as income level, could affect whether households are rejected or discouraged from accessing loans, and therefore sample selection could cause biases. However, those potential biases might affect the results so as to underestimate the effects of the variables. In this regard, for income come levels, we found consistently significant results in all specifications despite possible sample selection biases, although the other variables such as being self-employed might be underestimated. Therefore, any future study on Cambodian household FX borrowing should address this issue.

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<sup>21</sup> Nonetheless, because education attainment could be thought of as an exogenous variable in our setting, the estimated effect of the difference in education attainment on risk-hedging behaviors could at least reflect a causal link.

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Table 1. Exchange rates (KHR/USD), Interest rate differentials, and Inflation over five years

Year (End of the year)	Exchange Rates	Annual Change	Annual interest rate on loans		CPI (Year on Year Changes)
			KHR	USD	
2011	4061.5	0.3%	19.4%	15.4%	4.91%
2012	3992.5	-2.6%	11.8%	11.6%	2.54%
2013	4008	-2.3%	15.7%	11.4%	4.65%
2014	4068.5	-0.5%	16.1%	11.5%	1.07%
2015	4051.5	0.4%	16.2%	11.6%	2.85%

Source: National Bank of Cambodia.

Note: Exchange rates represent the midpoint of selling and buying rate of market exchange rates.

Table 2. Frequency of Currency Types in Outstanding Loans by Lenders

Lender	Currency			Total
	KHR	USD	Baht	
Commercial Bank	31 (19%)	123 (76%)	8 (5%)	162
Microfinance institution	123 (32%)	252 (66%)	8 (2%)	383
Family or friends	42 (41%)	51 (50%)	9 (9%)	102
NGO	3 (38%)	5 (63%)	0 (0%)	8
Other informal lender	7 (54%)	4 (31%)	2 (15%)	13
Others	4 (100%)	0 (0%)	0 (0%)	4
Total	210 (31%)	435 (65%)	27 (4%)	672

Note: Author's calculation from the survey data. In our data, there was one respondent who refused to answer the question about lender's information. We excluded the respondent from this table. We also excluded one respondent who answered that he had a loan in gold, since our interest in this study is in foreign currency denominated loans.

Table 3. Breakdown of Loan Characteristics by Currencies

		Amounts when granted (USD)	Amount of outstanding loans (USD)	Monthly interest rate (%)	Maturity (Monthly)	Collateral Required (Dummy)
FX	Mean	5298.31	3667.08	1.87	26.45	0.87
	Std.Error	(15670.08)	(17511.34)	(0.47)	(13.79)	(0.34)
	Observations	458	336	290	396	463
KHR	Mean	696.66	417.93	2.54	15.86	0.74
	Std.Error	(710.52)	(496.17)	(0.56)	(7.19)	(0.44)
	Observations	207	163	82	166	209
All	Mean	3865.92	2605.73	2.01	23.32	0.83
	Std.Error	(13179.70)	(14445.94)	(0.56)	(13.13)	(0.38)
	Observations	665	499	372	562	672
Difference Between FX and KHR	Difference	4601.65	3249.15	-0.67	10.59	0.13
	t-value	4.22***	2.36***	-10.98***	9.37***	4.07***

Note: Author's calculation from the survey data. \*\*\*, \*\*, and \* represents significance at 1%, 5%, and 10%, respectively.

Table 4. Interest Rates Differentials by Lenders

	Mean	S.D.	Number of Observations
<b>Commercial banks</b>			
FX	1.69	0.45	93
KHR	2.42	0.49	13
<b>Microfinance Institutions</b>			
FX	1.94	0.44	188
KHR	2.60	0.55	65
<b>Other lenders</b>			
FX	2.10	0.67	9
KHR	1.92	0.55	4

Table 5. Breakdown of Ratios of FX Currency by Currency Choices

		All Loan Holders	KHR Loan Holders	FX Loan Holders	Households with No Loans
Ratio of Foreign Currency Savings to Total Savings	Mean	0.37	0.22	0.43	0.33
	Std.Error	(0.42)	(0.35)	(0.43)	(0.41)
	Observations	308	88	225	790
Ratio of Foreign Currency Income to Total Income	Mean	0.28	0.19	0.32	0.25
	Std.Error	(0.33)	(0.30)	(0.33)	(0.31)
	Observations	614	187	439	1550
Ratio of Foreign Currency Expenditure to Total Expenditure	Mean	0.09	0.03	0.12	0.09
	Std.Error	(0.16)	(0.08)	(0.18)	(0.17)
	Observations	632	197	447	1632

*Note:* see Appendix. 1 for the detailed definition of variables listed in the table.

Table 6. Estimation Results of Baseline Models

	(1)	(2)	(3)	(4)	(5)	(6)
Ratio of FX Savings	0.145** (0.06)			0.114* (0.06)		0.093 (0.06)
Ratio of FX Income		0.230*** (0.07)		0.217*** (0.07)	0.197*** (0.07)	0.188*** (0.07)
Ratio of FX Expenditure			0.749*** (0.29)		0.665** (0.27)	0.639** (0.27)
Higher in Education Level	0.102* (0.05)	0.106** (0.05)	0.075 (0.05)	0.103** (0.05)	0.076 (0.05)	0.074 (0.05)
No Saving Dummy	0.015 (0.05)			0.019 (0.05)		0.017 (0.05)
Log. Total Income	0.088*** (0.02)	0.084*** (0.02)	0.081*** (0.02)	0.082*** (0.02)	0.076*** (0.02)	0.075*** (0.02)
Expectation for Depreciation	-0.173 (0.11)	-0.228** (0.10)	-0.190* (0.11)	-0.219** (0.10)	-0.231** (0.10)	-0.223** (0.10)
Don't Know (Exchange rates)	-0.013 (0.05)	-0.020 (0.05)	-0.016 (0.05)	-0.016 (0.05)	-0.018 (0.05)	-0.014 (0.05)
Self Employee	0.021 (0.06)	0.048 (0.06)	0.015 (0.06)	0.050 (0.06)	0.046 (0.07)	0.047 (0.07)
Older (More than 40)	0.014 (0.04)	0.008 (0.04)	-0.000 (0.04)	0.017 (0.04)	0.005 (0.04)	0.013 (0.04)
Rural Dummy	-0.116*** (0.04)	-0.117*** (0.04)	-0.104** (0.04)	-0.110*** (0.04)	-0.100** (0.04)	-0.095** (0.04)
Borrowed from formal FI	0.204*** (0.04)	0.206*** (0.05)	0.220*** (0.04)	0.201*** (0.05)	0.214*** (0.05)	0.208*** (0.05)
Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	553	545	553	545	543	543

Note: \*\*\*, \*\*, \* represent significance level at 1, 5, and 10 percent, respectively. In the estimation, we winsorized the sample at 1% of the distribution of total income to reduce the bias from outliers.

Table 7. Estimation Results with Interaction Terms of Education Levels

	(1)	(2)	(3)	(4)	(5)	(6)
Ratio of FX Savings						
Lower in Education Level		0.123 (0.11)	0.132 (0.11)		0.165 (0.11)	0.162 (0.11)
Higher in Education Level		0.114* (0.07)	0.071 (0.06)		0.079 (0.06)	0.052 (0.06)
Ratio of FX Income						
Lower in Education Level	0.129 (0.08)	0.146 (0.09)	0.112 (0.09)	0.178* (0.09)	0.221** (0.10)	0.159* (0.10)
Higher in Education Level	0.249*** (0.09)	0.282*** (0.10)	0.245** (0.10)	0.194** (0.09)	0.205** (0.09)	0.193** (0.09)
Ratio of FX Expenditure						
Lower in Education Level	0.882* (0.52)		0.868* (0.51)	0.988* (0.55)		0.976* (0.54)
Higher in Education Level	0.614** (0.27)		0.594** (0.25)	0.524* (0.27)		0.509* (0.27)
Higher in Education Level (dummy)				0.068 (0.06)	0.102** (0.05)	0.064 (0.06)
No saving (dummy)		0.017 (0.05)	0.017 (0.05)		0.020 (0.05)	0.021 (0.05)
Log. Total Income	0.076*** (0.02)	0.083*** (0.02)	0.075*** (0.02)	0.075*** (0.02)	0.083*** (0.02)	0.074*** (0.02)
Expectation for Depreciation	-0.232** (0.10)	-0.221** (0.11)	-0.220** (0.11)	-0.229** (0.10)	-0.213** (0.11)	-0.214** (0.10)
Don't Know (Exchange rates)	-0.023 (0.05)	-0.022 (0.05)	-0.019 (0.05)	-0.019 (0.05)	-0.017 (0.05)	-0.016 (0.05)
Self Employee	0.045 (0.07)	0.050 (0.06)	0.046 (0.07)	0.043 (0.07)	0.049 (0.07)	0.043 (0.07)
Older (More than 40)	-0.000 (0.04)	0.009 (0.04)	0.008 (0.04)	0.006 (0.04)	0.018 (0.04)	0.014 (0.04)
Rural Dummy	-0.102** (0.04)	-0.116*** (0.04)	-0.096** (0.04)	-0.098** (0.04)	-0.110*** (0.04)	-0.092** (0.04)
Borrowed from formal FI	0.209*** (0.05)	0.193*** (0.05)	0.203*** (0.05)	0.212*** (0.05)	0.200*** (0.05)	0.206*** (0.05)
Province Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	543	545	543	543	545	543

Note: \*\*\*, \*\*, \* represent significance level at 1, 5, and 10 percent, respectively. In the estimation, we winsorized the sample at 1% of the distribution of total income to reduce the bias from outliers.

Table 8. Effect of Usage of Financial Services on Risk-Hedging Behaviors

	(1)	(2)	(3)	(4)
Dependent variable: Dummy for having FX loans				
	Proxy for financial literacy			
	Experience of Borrowing in the past	Having Bank Accounts	Using Bank Transfer	Having Saving
Ratio of FX Income				
Yes	0.214*** (0.08)	0.425*** (0.12)	0.298** (0.14)	0.197** (0.08)
No	0.074 (0.27)	0.157* (0.08)	0.179** (0.09)	0.197* (0.12)
Ratio of FX Expenditure				
Yes	0.627* (0.32)	0.319 (0.23)	0.553** (0.24)	0.665*** (0.23)
No	1.094*** (0.34)	0.906*** (0.27)	0.687** (0.27)	0.844** (0.36)
Log. Total Income	0.075*** (0.02)	0.076*** (0.03)	0.076*** (0.03)	0.076*** (0.03)
Expectation for Depreciation	-0.246** (0.10)	-0.249* (0.13)	-0.231* (0.13)	-0.242* (0.13)
Don't Know (Exchange rates)	-0.023 (0.05)	-0.018 (0.06)	-0.017 (0.06)	-0.023 (0.06)
Self Employee	0.052 (0.07)	0.042 (0.05)	0.043 (0.05)	0.049 (0.05)
Older (More than 40)	-0.008 (0.03)	-0.005 (0.05)	-0.009 (0.05)	-0.008 (0.05)
Rural Dummy	-0.108** (0.04)	-0.099** (0.04)	-0.107** (0.04)	-0.104** (0.04)
Borrowed from formal FI	0.194*** (0.06)	0.200*** (0.06)	0.209*** (0.06)	0.209*** (0.06)
Observation	543	543	543	543

Note: \*\*\*, \*\*, \* represent significance level at 1, 5, and 10 percent, respectively. In the estimation, we winsorized the sample at 1% of the distribution of total income to reduce the bias from outliers.



## Appendix 1. Definitions of Variables used in Regression

Ratio of FX saving to Total saving	The ratio of total amount of foreign currency saving to total savings. This takes the value zero if households do not have any savings.
No Saving (Dummy)	This is a dummy variable which takes the value one if the household did not have any savings. Otherwise, it takes zero.
Ratio of FX income to Total income	The ratio of total amount of foreign currency income to total income
Ratio of FX Expenditure to Total Expenditure	The ratio of total amount of foreign currency expenditure to total expenditure.
Log. Total Income per capita	Natural logarithm of total income, including the remittance, divided by number of family members.
Expectation of Depreciation	This dummy variable takes the value one if households answered more than 4100 in the question “In 6 months from now, what do you think the USD/KHR exchange rate will be?” Otherwise, it takes the value zero. In addition, if the respondent did not answer or refused to answer the question, it takes the value zero.
Don't Know (Exchange rate change)	This is a dummy variable which takes the value one if the respondent did not answer or refused to answer the question “How much do you think the exchange rate of KHR to USD will be in 6 months.” Otherwise takes the value zero.
Low in Education Level	This dummy variable takes the value one if a respondent answered “No schooling” or “primary school.” Otherwise, it takes the value zero.
High in Education Level	This dummy variable takes the value one if a respondent answered “secondary school,” “high school,” “bachelor degree,” or more to the question about the household head’s education level. Otherwise, it takes the value zero.
Rural Area (Dummy)	This dummy variable takes the value one if a household was living in a rural area according to the definition given by Cambodian government. Otherwise, it takes the value zero.
Self-Employee (Dummy)	This dummy variable takes the value one if a household has an income source from business ownership. Otherwise, it takes the value zero.
Old (Dummy)	This takes the value one if the household head was older than the age of 40.
Borrowed from formal FI	This dummy variable takes the value one if a households had a loan from commercial banks or microfinance institutions. Otherwise, it takes the value zero.
Experience of borrowing in the past	This dummy variable takes one if a household had experienced of borrowing from formal financial institutions in the past three years. Otherwise, it takes the value zero.
Having Bank Account	This dummy variable takes the value one if respondents answered “Yes” to either of the question “Does household head have an account in a bank or an MFI?” or the question “Does any other household member living in the household have an account in a bank or an MFI?” Otherwise, it takes the value zero.
Using Bank Transfer	This dummy variable takes the value one if any household member had experienced using money transfer in formal financial institutions in 2014. Otherwise, it takes the value zero.
Having Saving	This dummy variable takes one if any household member has any form of financial assets, including cash holding for savings purposes.

## Appendix 2. Descriptive Statistics of Variables used in the Estimation

Variable	Obs	Mean	Std. Dev.	Min	Max
FX loan	617	0.715	0.452	0	1
No saving (dummy)	617	0.514	0.500	0	1
Ratio of FX Savings	617	0.185	0.351	0	1
Ratio of FX Sales	606	0.283	0.327	0	1
Ratio of FX Expenditure	615	0.094	0.162	0	0.909
Log. Total Income	617	6.608	0.997	3.912	9.086
Expectation for Depreciation (dummy)	617	0.024	0.154	0	1
Don't Know (Exchange rates)	617	0.776	0.417	0	1
Self Employee (dummy)	617	0.527	0.500	0	1
Older (More than 40)	617	0.627	0.484	0	1
Rural Dummy	617	0.485	0.500	0	1
Borrowed from formal FI	617	0.827	0.379	0	1
Experience of Borrowing in the past	617	0.8444084	0.3627618	0	1
Having Bank Account	617	0.2009724	0.4010526	0	1
Using Bank Transfer	616	0.183442	0.3873426	0	1
Having Saving	617	0.5672609	0.4958573	0	1

*Note:* the sample used in the estimation only covers households with loans, and we excluded those households which had no loans when interviewed. We also winsorized the sample at 1% of the distribution of total income to reduce the bias from outliers.

### Appendix 3. Correlation Matrix of Variables used in Estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) FX loan	1											
(2) No saving (dummy)	-0.03	1.00										
(3) Ratio of FX Savings	0.14	-0.54	1.00									
(4) Ratio of FX Sales	0.21	-0.06	0.19	1.00								
(5) Ratio of FX Expenditure	0.24	-0.05	0.22	0.28	1.00							
(6) Log. Total Income	0.20	0.00	0.11	0.05	0.17	1.00						
(7) Expectation for Depreciation (dummy)	-0.04	-0.06	0.00	0.08	-0.02	0.02	1.00					
(8) Don't Know (Exchange rates)	-0.04	0.13	-0.09	-0.01	-0.04	-0.05	-0.29	1.00				
(9) Self Employee (dummy)	0.12	-0.11	0.10	-0.01	0.13	0.09	0.00	-0.12	1.00			
(10) Older (More than 40)	0.01	0.05	-0.12	-0.01	-0.03	-0.14	-0.05	0.07	-0.18	1.00		
(11) Rural Dummy	-0.11	-0.06	-0.09	0.00	-0.09	-0.12	0.02	0.01	-0.09	-0.06	1.00	
(12) Borrowed from formal FI	0.12	-0.02	0.03	0.03	-0.09	0.05	-0.01	0.13	-0.08	0.13	0.02	1.00

## Abstract (in Japanese)

### 要約

外貨（ドル）建ての借り入れ、いわゆる金融ドル化と呼ばれる現象は途上国経済において広く見られる現象であるが、特にカンボジアでは、M2に対する銀行の外貨預金額の比率でみた場合に、2014年の時点で約83%となっており、ドル化が高度に進行している。本稿では、カンボジア中央銀行とJICA研究所の共同プロジェクトとして2014年に行われたカンボジアの2237戸の家計へのインタビュー調査で得られたデータを用いて<sup>1</sup>、カンボジアの家計部門における外貨建て借入行動についての決定要因の分析を行った。収集された個票データから家計の通貨別の金融活動について把握することが可能となっており、このデータを用いて家計の外貨借入行動に関する先行研究で提示されている資産選択理論による説明の妥当性について実証を行った。実証分析では、借入を行っている家計にサンプルを絞り、家計がドル借入を行っているかどうかの二値変数を被説明変数とし、プロビットモデルによる推定を行った。分析の結果、収入の通貨構成の中で外貨建ての比率が高くなるとより外貨建ての借り入れを選択する確率が高くなることが分かり、為替リスクに対するリスクヘッジ行動の結果として外貨建ての借り入れを選択しているとする資産選択理論に基づく仮説が支持される結果となった。また、自国通貨が将来減価すると予想する場合には、自国通貨建ての借り入れを行う傾向にあることも明らかになった。さらに、本稿では為替リスクに対するリスクヘッジ行動の程度というのは世帯主の教育水準によって異なることも実証的に明らかにした。すなわち、教育水準の高い家計では収入と借入の通貨を一致させる行動がよりに強く見られたのに対し、教育水準の低い家計では収入ではなく支出の通貨と借入の通貨を一致させるよう行動していた。世帯主の教育水準が低いと為替リスクに対するリスクヘッジ行動をとらない傾向にあることが分かった。このことは、為替リスクに対するリスクヘッジ行動には、金融リテラシーが大きな働きをしている可能性を示している結果と考えられる。

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<sup>1</sup> 調査の全体の結果の概要については Odajima & Khou (forthcoming) でまとめられている。