Kittiprapha Jivasantikarn

Department of Economics
Stanford University
Stanford, CA 94305
jobj@stanford.edu

Under the Direction of
Professor Nicholas C. Hope

Abstract

Along the Thai-Burmese border region of the Sangkhlaburi District, Kanchanaburi province, Thailand, there reside displaced ethnic communities who migrated from Burma. These people have been deprived of access to commercial banks or any other formal financial services because they do not carry Thai identification cards. This form of financial exclusion acts as a barrier to development for this local community.

In order to analyze the effectiveness of one institution, the Pattanarak Credit Union (PCU), that addresses the financial needs of this community in terms of meeting legitimate financial needs of the migrant workers, I test if the PCU charges competitive rates and provides much-needed loans to the members of the group. This paper proposes a financial model to study the effectiveness of the PCU and analyzes the savings and borrowing mechanisms of its microcredit program. My honors thesis shows that the PCU’s mechanisms have been effective in keeping the default rate at zero and withdrawal rate low. This study also finds that the interest rates charged on borrowers should be raised to maximize dividends distributed back to members of the credit union, which is in keeping with the PCU’s social mission.

Keywords: microfinance, interest rate, microloan, migrant workers, financial exclusion

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An Analysis of the Credit Union for Migrant Workers in Thailand

I. INTRODUCTION

Along the border region of Thailand, there exist migrant workers, hill tribes, refugees and undocumented minorities who migrated to Thailand from Burma, Laos, and Cambodia. Without citizenship of the country where they reside, migrant workers and their family’s rights are limited. One of the limitations on basic human rights that directly serves to hinder economic growth in the migrant communities is ignorance of the right to their property.

Any business with a bank, post offices, or hospitals requires official identification cards. A person without the Thai citizenship who does not carry another country’s passport faces some hardship for he/she cannot use various services that are basic to the Thai population, including banking, education or health services. In particular, one such service is remittance transfer through the network of banks or postal offices scattered across the country.

An estimated two million migrant non-citizens, do not have proper government-issued identification cards (International organization for migration, 2011). To support their livelihood, they move to big cities with economic opportunities to work. However, once they earn income, they are unable to remit money directly to their families living in the border region. Without Thai identification cards, non-citizens were unable to have access to a reliable money transfer system, although such services are currently offered through banks or post offices. Therefore, migrant workers resort to sending money through informal systems, trusting an employer, a friend, or a complete stranger, who is a middleman, to send money back to their family in the border
region. Middlemen frequently take a significant fee of 20%-40% leaving migrant family residing along the border bereft of the potential amount of money and savings to smooth their consumption streams. There have been cases in which a middleman is found to be untrustworthy and has cheated stateless people of the whole amount.

One of the ways to decrease social and financial exclusion due to economic and political circumstances is to open channels for migrant workers to remit money safely and inexpensively. The Thailand post currently offers a low-cost money order service through which a person can initiate a transaction to send money to a recipient located in the coverage area of another post office. The problem is that a recipient has to verify his/her identity by showing his/her identification card, which has to be a Thai ID card or a passport of another country. Therefore, if Thailand post could be persuaded to include other types of IDs, non-citizens who have registered themselves in the government database and thus carry their migrant non-citizen ID cards also could benefit from the service.

With financial support from the Stanford Hass Summer Fellowship, my fellowship partner and I approached Thailand Post to propose our project. We worked with the Thailand post for three months during the summer of 2009. The work is related to enabling the underserved populations in Thailand who do not have Thai Identification cards to use existing facilities in remitting money. My fellowship partner and I, with collaboration from the post office of Thailand, drafted a new policy to include migrant workers as users of the money transfer service provided through the centralized and extensive network coverage of the post offices in Thailand.
The effort is a two-step process. The first step is to research rules and regulations regarding the rights of stateless persons and convince Thailand post to enact an internal policy change. The law states that non-citizens have every right to transfer their property, but people’s lack of understanding and the existing prejudices against people without citizenship serve as huge barriers in the remittance process. As a result, a vital step is to correct people’s misunderstanding of non-citizens’ rights, which leads to the second step of our effort to raise awareness of the availability of the service to the targeted population.

My fellowship partner and I took the opportunity to visit organizations that work closely with migrant populations on the ground to collect data and conduct interviews, in preparation for a campaign that will be needed to raise awareness about the new remittance service provided by Thailand post, while waiting for the policy enactment. During our visits, we found that there are also other major financial issues besides access to remittance transfer services that affect this population and deserve serious attention, namely, credit provision and accessibility of savings.

Financial exclusion is the lack of access faced by certain sections of the population to such basic financial services as savings and borrowings. The unavailability of financial services for people living in poverty serves as a barrier for poor economies to develop. Their access to sources of credit is restricted and this impairs their ability to ease their circumstances. Financial exclusion also leaves migrant workers who are living in poverty vulnerable to loan sharks. Moreover, without savings instruments, migrant workers’ money is not well protected from inflation and the temptation to
spend. Therefore, underserved communities, without access to financial services, have to manage their resources or personal finances on a cash-only basis.

Another approach to expanding financial inclusion for the underserved populations is to find channels for migrant workers to save money and obtain credit when needed. For economic reasons, migrant workers have difficulty earning sufficient money or acquiring proper documents to justify opening accounts with banks. Moreover, each household tends to borrow small amounts of money to support their daily expenses. For example, on average, the amount each household borrows in three months is under $30 each time a migrant person takes out a loan (The Pattanarach savings group annual report, 2008). Banks do not normally transact microloans because it is unprofitable to do so. At the same time, migrant workers have little capital to offer as collateral to banks and they lack local guarantors who could serve as collateral. Therefore, credit provision to migrant workers through commercial banks faces the aforementioned barriers.

A vast array of practices in microcredit institutions has emerged tailored to the needs of particular communities; thus rules and regulations differ across countries. In order to analyze the effectiveness of a credit program in terms of charging competitive rates and providing sufficient much-needed loans to the members of the group, we need to develop and modify the financial model of the program. In this paper, I study the effectiveness of and analyze the savings and borrowing mechanisms of the microcredit program that has been implemented since 2007 in the Thailand border region with increasing household membership each year.
The paper is organized as follows. Section 1 discusses the background of the problem facing populations at the Sangkhlaburi border and how local savings groups have been established. Section 2 reviews the existing literature on microcredit programs and presents an existing financial model of credit unions, which is similar to the lending, borrowing and saving schemes adopted by Pattanarak’s savings groups of Sangkhlaburi. Section 3 presents a quantitative data analysis that proposes a model to analyze the savings group program at Sangkhlaburi. Section 4 presents the analysis and result of the study. Section 5 describes the data set, covers qualitative analysis and discusses the effectiveness of the program. Section 6 provides further recommendations and section 7 concludes. Appendix A presents the derivation of the reduced form of the optimal interest rate that the PCU should charge its borrowers. Appendix B presents the result of my sensitivity analysis.

**A case study: Pattanarak foundation village funds**

Migrant workers in the Sangkhlaburi district, Kanchanaburi province, are permitted to live in Thailand temporarily and are not allowed to travel to other provinces. They are mainly landless, have no education and make a living as daily laborers. Survival is considerably difficult. The migrants search such additional food from the forest as bamboo shoots and mushrooms, and find an alternative source of income in making brooms and tat roofing grass.

Young people often migrate to work in the cities with economic opportunities. This is considered illegal if those who hire them do not provide them with the application to obtain work permits, which happens frequently because of the additional costs imposed by the process. If migrant workers are fortunate and get a job legally, they...
send money back to their families residing along the border. Unlucky ones are deceived and taken advantage of by those who hire them, with the threat of reporting them to the police, and they have to work as cheap laborers or are forced into illegal work such as prostitution or drug trafficking. According to Mr. Adul, the field officer of People for Burma Foundation, if migrant workers are arrested, they are deported to Myanmar and face a life sentence in jail. Despite the high risks of being arrested, non-citizens migrate to big cities because of the lack of economic opportunities in the border region.

Commercial banks are an important avenue for assisting this population because they have capital to lend and in-built risk evaluation systems. However, the poor, in general, have little possibility of obtaining credit from such institutions because the poor have few assets they can use as collateral to insure against default. This gives rise to the implementation of village funding programs that are available exclusively for those carrying Thai identification cards. Temporary residents carrying other types of identification cards are ineligible for the program.

In case of emergency, when migrant non-citizens are in need of a loan, for example, to buy food, they have to borrow food from their relatives or request credit from the local grocery store. When they get sick, they become a burden on their relatives who are in the same difficult financial circumstances.

Such limitations and conditions give rise to moneylenders who can charge approximately 20% per month on loans (The Pattanarak savings group annual report, 2008). Small clients who default face a life-time punishment of never being given
another loan, as well as being humiliated in public and suffering from coercive methods to enforce repayment. The payment scheme offered by moneylenders is usually inflexible.

Despite several attempts to implement microfinance programs for those living in poverty, participation in village funding programs is exclusive to those who carry Thai identification cards. Migrant workers carrying non-citizen identification cards or those who are temporary residents cannot join the programs.

This situation provides an opportunity for the entry of the informal savings groups for migrant workers with the assistance of the Pattanarak foundation. The groups’ principal goals are to provide credit to small borrowers, especially for emergencies, and to mobilize rural savings.

There needs to be operating systems that can provide affordable credit and safe places for deposits for migrant workers. Some attempts include the establishment of informal lending groups, credit cooperatives or credit unions. Due to voluntary financial exclusion, lending and saving arrangements need to pool resources among migrant workers without reliance on existing institutions.

As far as the management, rules and regulations are concerned, there are two types of savings group. The first group is called loyalty savings. In this group, each member is committed to a monthly deposit of a fixed amount, determined at the entry to the group, for one year. In the group, the amount each member has to save is inflexible. When members earn less, they save less. Members who want to take out loans from
the group have three months to repay their loans, with some flexibility in loan repayment that can be made in installments. The maximum loan that can be borrowed by each member of the savings group varies across groups contingent on how much the member saves with the group and how disciplined his/her repayment behavior is.

There have been six savings group along the border in the Sangkhaburi area with each group consisting of people within the same community or living in proximity for effective control and management, though members from different villages are welcome. Aggregate savings of each group are put to work through loans issued to members who are in need of credit and the amount that is left over each month is put in bank accounts. In other words, members create both demand and supply of funds provided by the savings group. Each savings group is managed and run by board members selected each year by members of the group. Interest rates and dividends are determined at the beginning of the year by board members. At the end of the year, profits of savings groups are distributed as dividends to members in proportion to how much they contribute to the funds of the savings groups, with some portion allocated to income-generating activities for villages such as setting up cooperative stores, fixing schools or growing vegetables, and the rest to covering operating costs of running the credit union. There exist no barriers for people who want to become members of a savings group in that there are no necessary documents to fill in or requirements for the identification cards.

II. LITERATURE REVIEW
Because of the increasing attention to the problem of financial exclusion facing the poor, microcredit and microfinance have become popular as promising tools to help
the poor gain access to financial services. Although, the majority of the literature emphasizes the benefits of reducing financial exclusion of the poor, there are some economic reasons that prevent the marketing of financial products to the poor from functioning well. In this section, I review the literature related to the poor’s lack of access to financial services and the need for interventions. After that, I discuss the literature that explains why the poor suffer from the financial exclusion. Although the economics of financial services for the poor are not the main direct focus of this paper, classifying the factors that cause the poor to be excluded from existing financial services will lay a foundation for understanding the financial model of a credit union. In the last sub-section, I review the existing financial model of and studies on credit unions, which are then the focus of this study which is to analyze the effective determination of interest rates by a credit union.

1. Financial exclusion facing the poor and market intervention

One school of thought holds that the perpetuation of poverty is caused in part by the lack of institutions that brings money to the poor as a basis for them to grow. Commercial banks have operating practices that require potential lenders to have collateral and a credit history meaning that they tend to give money to those who already have access to money (Yunus, 2007). Yunus perceives the inability to use financial services, rather than unemployment, as a root cause of poverty. He views the barriers the poor confront in their access to financial services as stemming from banks’ profit orientation. Savings and loans among the poor are generally at the subsistence level. Bankers, if driven by profit maximization, avoid making small loans to the poor because of the higher costs of doing so. The cost of credit delivery is essentially flat, meaning that the delivery cost per loan remains about the same while
the income generated from loans increases with size (Reserve Bank of India, 2011). Therefore, bankers would rather make fewer loans for larger amounts. Moreover, the higher cost of small transactions include the hassle that bankers have to go through in order to teach the poor to fill out necessary paperwork or monitor their behaviors because of the lack of collateral and credit histories. This way, financial institutions perceive the poor as non-credit worthy. This creates an opportunity for moneylenders who enter the system under rules and regulations of loan provision that are set differently from those of banks. Most of the time they charge higher rates for loans. Yunus views moneylenders as contributors to an endless cycle of poverty because the poor are the ones who have to pay the most for much-needed basic financial services.

However, Armendariz and Morduch present another economic explanation for why the allocation of financial services to the poor fails, regardless of a bank’s profit orientation. They explain the puzzle of financial exclusion from the viewpoint of basic economics. Due to the diminishing returns principle that is derived from concavity of production functions, with each additional unit of capital, the incremental gain becomes smaller. Therefore, banks should be willing to serve the poor due to higher returns to their investment and poor households should be able to offer banks higher interest rates on their loans. Capital should be automatically flowing to the poor allowing them to climb the economic ladder. However, in reality, market failures caused by asymmetric information, high transaction costs and difficulties in enforcing contracts for the poor are present, giving rise to the problem of financial exclusion.
Asymmetric information creates two problems: adverse selection and moral hazard. Adverse selection occurs when banks cannot distinguish between risky and safe borrowers. Therefore, banks have to take into account the added probability of default causing them to charge high interest rates. This drives safer borrowers out of the market. Consequently, the default rate is high and can cause the credit market to fail. Moral hazard refers to situations in which banks face risk because of unobservable choices made by customers or the inability to realize project returns. The price of credit or the interest rate is driven up to compensate for the potential loss in banks’ loan repayments causing the market to be left with risky customers with high default rates.

Accordingly, the amount of loans available in the market is not determined simply by demand and supply (Stiglitz, 1981). In a perfectly competitive market, anyone who is willing to take on loans at high interest rate should be able to do so. However, due to imperfect information, banks’ credit has to be rationed resulting in excess demand for loanable funds. Therefore, the poor remain underserved because of high risk facing them and lack of collateral. Such problems can be eliminated if banks have access to cheap ways to gather information about their customers and ways to enforce repayment contracts. However, banks normally face high transaction costs when issuing several small loans in poor communities. Another solution is available if banks can lend to those with assets used as collateral. However, poor customers are normally too poor to have assets to offer as collaterals. Accordingly, the poor remain excluded from existing financial services.
In the *Economics of Microfinance*, the authors do not present the lack of access to financial services for the poor as a channel for moneylenders to exploit the system and thus do not attribute the endless cycle of poverty to the existence of moneylenders. Even though they charge higher interest rate than those offered by banks, high rates that they charge can really reflect high costs they have to cover. Such costs include monitoring the use of loans, enforcing repayment or pre-screening customers. Therefore, intervention to eliminate moneylenders can worsen the situation for the poor. Intervention through microfinance is desirable if the current credit market offered by moneylenders is inefficient. Therefore, credit market intervention can be justified when it promises to improve the efficiency of the market.

Morduch and Armendariz investigate the efficiency of the market for financial services for the poor. As far as credit market efficiency is concerned, the market is characterized as monopolistic competition. This is because lenders operate in segmented markets, each handling a small share of the overall market. Therefore, monopolies exist locally and in a short run. However, since entry is free, moneylenders cannot keep making excess profits over the long run. Moreover, the average cost of provision of loans by moneylenders is higher than marginal costs. This is because there exists a high fixed cost which involves the cost of entering the market and pre-screening cost. Such characteristics are hallmarks of monopolistic competition. Regardless of whether monopolistic moneylenders are exploitative, it is inefficient to have them operate in this business because they are resource constrained as well and they only become informed about small segments of the market in which they operate. Therefore, intervention in the credit market can be justified and it can be
done cost-effectively by gaining reliable information about borrowers in a broader scope.

Market intervention through microfinance needs to bring more resources into a local market and make use of local information. If moneylenders who have access to monitoring mechanisms through local information and banks with capital to offer to the poor can join force, financial services can cater to the poor. To overcome the problem of financial exclusion, most satisfactory methods need to involve groups so as to foster close monitoring and screening mechanisms. Face-to-face relations and trust-building ties among villagers can eliminate the asymmetric information that causes market to fail.

2. A Financial model of a credit union

Smith et al. develop a theoretical framework for credit union (CU) behavior that incorporates a CU’s unique characteristics (1981). To model that behavior, two characteristics of CU’s need to be taken into account. First, in a CU, members are both owners and consumers or suppliers of credit output. Second, in a CU, members demand and supply loanable funds.

Therefore, the objective function should focus on the value of participation to members who are both savers and borrowers. The value to the borrower is the difference between the CU loan rate and the best alternative market rate times the level of loan and is represented by net gain on loans (NGL). The value to a saver is the net gain on savings (NGS), which is the difference between the CU savings rate and the best alternative market rate. Both savers and borrowers also obtain dividends
distributed proportionally to the profit ($\pi$) that the credit union makes. Therefore, the CU will maximize over $NGL$, $NGS$ and $\pi$.

The saver-borrower conflict is resolved by weighting the contributions of $NGL$ and $NGS$ to the objective function. This is done by assigning the parameters $\lambda$ and $\sigma$ to represent the weight on $NGL$ and $NGS$ respectively. The objective function of the credit union is (see definition below):

$$\max_{r_L, r_S} \lambda \cdot NGL + \sigma \cdot NGS + \pi$$ (1)

where

$$NGL = (r_{LM} - r_L)L$$ (2)

$$NGS = (r_S - r_{SM})S$$ (3)

$$\pi = r_L L - r_S S - r_{DM} D - C_L L - C_S S - \overline{E}$$ (4)

$$D = L - S$$ (5)

The level of loans demanded is proportional to the spread between the credit union rate, $r_L$, and the best alternative market rate, $r_{LM}$.

$$L = \alpha (r_{LM} - r_L) \ , \ \alpha > 0$$ (6)

The level of savings supplied is proportional to the spread between the best alternative deposit market rate, $r_{SM}$, and the credit union rate, $r_S$.

$$S = \beta (r_S - r_{SM}) \ , \ \beta > 0$$ (7)

The decision variables are:

the loan interest rate, $r_L$
and the deposit interest rate, $r_S$

**Description of the variables:**

$\pi$ is the operating surplus which is distributed to members as a dividend.

$L$ is the level of loans

$S$ is the level of deposits

$r_{DM}$ is the market rate of loan offered by banks

$r_{LM}$ is the loan market rate available

$r_{SM}$ is the interest rate on savings offered by bank

$D$ is the amount of credit union net borrowing, $(L - S)$

$C_L$ is the average costs associated with processing loan accounts by the CU

$C_S$ is the average costs associated with processing savings accounts by the CU

$\overline{E}$ is the sum of all fixed expenditures

Substituting (2) through (7) into (1) yields a standard constrained optimization problem. The credit union chooses the optimal loan and deposit rates, $r_L^*, r_S^*$ to maximize the net gain available to members. The rates that the credit union sets will depend on the orientation of the credit union.

This model’s capability can provide insights into how the rates are determined depending on the orientation of the credit union: the four types of orientation are surplus maximization, borrower domination, saver domination and neutrality.

Case A: surplus maximization, $\lambda = 0, \sigma = 0$

Case B: Complete Borrower Orientation, $\lambda = 1, \sigma = 0$

Case C: Complete Saver Orientation, $\lambda = 0, \sigma = 1$

Case D: Equal Treatment or Neutrality, $\lambda = 1, \sigma = 1$
III. QUANTITATIVE ANALYSIS

In this section, I will analyze the PCU by applying the credit union financial model mentioned in section II. I will describe the assumptions I use to modify the model. Then I will analyze the model quantitatively to calculate the optimal interest rates that the PCU should charge. This section comprises three sub-sections which are assumptions, analysis, and results.

Assumptions

The aforementioned model can be used as a framework to develop a more specific model to explain the situation facing a Pattanarak village funds group. In this section, I will make the following assumptions that would apply to the specific case of the PCU.

1. The utility of the maximum loan is described by a log function because of the principle of diminishing marginal utility. The equation is

\[ U(L_{\text{max}}) = a \ln(L_{\text{max}}) + b \]  

(8)

2. There is no default when a person borrows from moneylenders because of perfect information and “coercive” approaches to repayment.

3. Moneylenders provide loans the size of which are contingent upon an individual’s wealth \((w_i)\). For simplicity, we will take savings as a wealth index. Therefore, an individual with savings \(s_i\) will be able to take out loan \((1 + \gamma) s_i\) where \(\gamma\) is a constant depending on how risk averse moneylenders are.
4. Moneylenders have limited resources to lend, $R$. Therefore, moneylenders will provide loans to a migrant worker that is

$$\min(R,(1+\gamma)w_i)$$

5. There is essentially unconstrained lending for credit union. This is because credit union is able to pool more money from the group. Therefore, in this model, the limited amount of resource of credit union is ignored.

6. If a person defaults, he has to lose his social capital $A_{social}$ in addition to his savings and future net gains on loans.

7. Moneylenders do not offer saving accounts. The only way migrant workers can save is by becoming a member of the PCU. Because saving with the PCU always gives more benefit than not saving at all or keeping savings in cash or food, migrant workers will save all their money with the PCU. As a result, the amount they save does not depend on other variables.

$$S = S \text{ (constant)} \quad (9)$$

8. The cost of processing loans and savings by the PCU is proportional to its profits. Since 2007, the PCU committee assigns 20% of the annual surplus to such operating costs as stationery, transportation, and so forth and they keep the leftover as compensation for their good service and the time spent running the credit union. Therefore, the profit of the credit union, $\pi$, is
\[ \pi = r_L L - r_S S - r_{DM} D - c \pi - E \]

\[ \pi = \frac{1}{1 + c} \left( r_L L - r_S S - r_{DM} D - E \right) \]

(10)

, where \( c \) is 0.2. For simplicity, I followed Smith’s model which assumes that \( r_{DM} \) operates as the same rate as \( r_{SM} \). Based on this model, I substitute the value of \( r_{DM} \) by taking the average of the interest rate that banks charge on loans and on savings. Note that \( D \) measures the PCU’s net borrowing \((L-D)\).

9. The Credit Union pays no interest rate on savings. This implies that net gain on savings \((NGS)\) is not an objective of the PCU. Therefore, PCU objective function becomes

\[ \text{Max} \quad \lambda \cdot \text{NGL} + E(\pi) \]

(11)

IV. ANALYSIS AND RESULT

We first investigate two options for borrowing: a moneylender and the credit union. For each option, we will explain why migrant workers will not default. Then we compare both options to show that because the credit union offers better services and benefits, the moneylender will eventually go out of business. This section also analyzes how the credit union operates optimally.

Case 1: Moneylenders are credit suppliers.

In this case, we assume that the possibility of defaulting is zero. This is for two reasons: the first is that moneylenders have perfect information about borrowers. Therefore, adverse selection can be mitigated. Second, moneylenders can adopt coercive methods to enforce repayment and this serves as a credible threat to
eliminate loan defaults. Thus, borrowers are expected to pay back their loans with interest.

The maximum loan that an individual can take from moneylenders is proportional to his/her wealth, $S_i$. The loan that an individual can take is $(1 + \gamma_{ML})S_i$. However, the maximum loan that an individual can take from a moneylender cannot exceed the moneylender’s capital, $R$. Therefore, according to (8), the utility of the maximum loan is

$$U(L_{\text{max}}) = a \ln \left[ \min \left( R, (1 + \gamma_{ML})S_i \right) \right] + b \quad (12)$$

In the interest paying period, an individual has to pay the interest on the loan of $r_{LM} \cdot L_i$ which is translated into an individual’s utility. In the principal paying period, an individual has to pay the loan interest of that period, $r_{LM} \cdot L_i$, and the full loan amount of $L_i$. Therefore, net utility of an individual who takes on loans from a moneylender becomes

**Interest paying period:**

A borrower has net utility of $-r_{LM} L_i + a \ln \left( \min \left( R, (1 + \gamma_{lender})w_i \right) \right) + b \quad (13)$

**Principal paying period:**

A borrower has net utility of $-r_{LM} L_i - L_i + a \ln \left( \min \left( R, (1 + \gamma_{lender})w_i \right) \right) + b \quad (14)$

**Case 2: Credit union (Pattanarak foundation) is a credit supplier.**

In this case, we assume that people are faced with two options, defaulting or paying back their loans. Since the PCU has a group of members and anyone can join the
group, the information regarding borrowers’ behaviors to the PCU staff is not perfect. Therefore, there exists default risk.

An individual who chooses to borrow from a credit union can borrow in proportional to his/her savings, $S_i$. Also, in the Pattanarak’s case, there is the prospect of progressive lending, which refers to the practice of promising larger loans for groups or individuals in good standing. The rate at which the loan ceiling increases is denoted by $\delta \cdot t$: $t$ refers to how long the member has been with credit union and $\delta$ is the rate at which the loan ceiling increases proportional to $S_i$. Therefore, the maximum loan that any credit union member can take is $(1 + \gamma_{cu})S_i + \delta t S_i$.

As already explained in case 1, during the interest paying period, a credit union member has to pay $r_L \cdot L_i$, which is translated into a utility of $-r_L L_i$, while during the principal paying period; a person has to pay back $r_L L + L_i$ which is also equal to the utility of $-r_L L - L_i$. However, if a credit union member decides to default, he has to lose his social capital ($A_{social}$), current savings ($S_i$) and the present value of his net gain on loans ($\frac{NGL_i}{r_{discount}}$). Therefore, the net utility of an individual who takes on loans from the Credit Union becomes

Interest paying period:

If pay back, a borrower has net utility of $-r_L L_i + a \ln((1 + \gamma_{cu})S_i + \delta t S_i) + b$ \hspace{1cm} (15)

If default, a borrower has net utility of $-A_{social} - s_i - \frac{NGL_i}{r_{discount}}$ \hspace{1cm} (16)

Principal paying period:
If pay back, a borrower has net utility of 
\[ -r_L L_i - L_i + a \ln \left( (1 + \gamma_{cu}) s_i + \delta t s_i \right) + b \]  
(17)

If default, a borrower has net utility of 
\[ -A_{social} i - s_i - \frac{NGL_i}{r_{discount}} \]  
(18)

From this, we can analyze if a person with such payoff of each decision will choose to default or payback the loan if he/she becomes a member of credit union. To be precise, the answer to this question depends on how large the social capital, \( A_{social} \), of each person is. If we know \( A_{social} \) of each person, we will be able to calculate the number of people who default and translate that into the probability of default.

However, as mentioned earlier, the social sanction cost is high because people in the community cannot afford to lose their relationship with others in the same community. They are ineligible for any future loans if they default and also lose their savings as their financial collateral. Therefore, the likelihood of repayment is high.

This conforms to the data, in that the default rate has always been zero since the onset of the program in 2007. For simplicity of the analysis, we will take the default rate to be zero in the case of loans from the credit union.

Let’s assume that borrowers pay the interest until the loans mature and the principal is paid back in the last period. According to (13), and (15), the utility of paying interest to moneylender is:

\[ -r_{LM} L_i + a \ln \left( \min \left( R_i (1 + \gamma_{lender}) w_i \right) \right) + b \]  
(19)

The utility of paying the interest to the credit union is:

\[ -r_L L_i + a \ln \left( (1 + \gamma_{cu}) s_i + \delta t s_i \right) + b \]  
(20)
When deciding which credit supplier he wants to borrow from, a person will base the decision on the present value of the sum of the net utility obtained during the interest paying period and the principal paying period when he borrows from a moneylender or when he borrows from the Credit Union. The PCU charges a lower interest rate on loans and offers an opportunity for people to build financial collateral to obtain larger loans. According to (19) and (20), the net utility of making repayments during the interest paying period is always greater in the case where people borrow from the PCU. The same is true for the principal paying period. Therefore, the net present value of the net utility is greater in the case of credit union. At a steady state, I then conclude that a credit union will drive moneylenders out of the credit market. People are better off borrowing from the PCU in the long run. My conclusion is that, in the long run, migrant workers residing along the border region will obtain loans provided by the credit union instead of moneylenders and the default rate will approach zero.

Once the default rate is set at zero, the expected value of profit, \( E(\pi) \) then can be substituted for the profit, \( \pi \). Also, according to assumption 7, the saving interest rate is no longer a decision variable since the PCU offers no interest on savings. The objective function then becomes

\[
\text{Max}_{r_L} \quad \lambda \cdot \text{NGL} + \pi
\]

(21)

Appendix A shows how this maximization problem was solved. The solution to this problem is

\[
r_L^* = \frac{1}{2} \left( \frac{r_{DM} - r_{LM}}{1 - \lambda(1+\epsilon)} \right) + r_{LM}
\]

(22)
The fact that the PCU staff encourages people to borrow instead of withdrawing their savings to smooth their consumption streams shows that they want members to retain their eligibility to receive dividends. This is why I assume that the PCU is oriented towards surplus maximization with $\lambda = 0$. This is also consistent with the interviews conducted with the PCU staff. Of the three factors in the PCU objective function, all of the staff members said that they give the most weight to the PCU surplus ($\pi$), since both savers and members are entitled to some shares of the annual dividends.

From (22), the optimal interest rate charged by the PCU on borrowers when $\lambda = 0$ is:

$$r_L^* = \frac{r_{LM} + r_{DM}}{2}$$

(23)

Applying this optimal rate, we find the function for the optimal profit which is:

$$\pi = \frac{1}{1 + c} \left[ \frac{\alpha (r_{LM} - r_{DM})^2}{4} + r_{DM} S - E \right]$$

(24)

From the data,

$$r_{LM} = .10$$
$$r_{DM} = .008$$

Therefore,

$$r_L^* = .054$$
Figure 1 shows the plot between the slope of profit, the slope of $\lambda \cdot NGL$ and the slope of objective function and $r_L$.

Since the weight on $NGL$ ($\lambda$) is zero, the slope of the weighted net gain on loan does not depend on the interest rate $r_L$ meaning that the net gain on loan does not change when the interest rate increases. The slope of the profit ($\frac{d\pi}{dr}$) is positive showing that the PCU profit increases with $r_L$. Thus, when the credit union charges higher interest rates, it makes more money. However, the slope of the profit decreases with $r_L$ and when the slope of the profit is zero, the credit union is charging $r_L$ that maximizes the profit. However, after this point, the higher the interest rate is, the more people will resort to moneylenders. Therefore, the profit of the PCU decreases when it charges more.

We can see that the rate that maximizes the objective function (f) is the rate that makes $\frac{df}{dr_L}$ zero. From the graph, the optimal interest rate is .054, which matches the calculation. However, the current rate that the PCU is charging its borrowers is .02, which is lower than the optimal rate for this credit union to maximize profit.
This leads me to conduct another test with the data to estimate what the PCU orientation actually is. If we assume that it is the PCU’s intention to charge the rate of .02 on loans, we find the weight that the PCU assigns to $NGL$ to be 0.354.

Figure 2 shows the plot between the slope of profit, the slope of $\lambda \cdot NGL$ and the slope of objective function and $r_L$.

From this graph, the interest rate $r_L$ of 0.02 maximizes the objective function when $\lambda \neq 0$. In this case, the slope of $\lambda \cdot NGL$ is negative, meaning that the members’ net gain on loans decreases as the interest rate increases. The part where the slope of $\lambda \cdot NGL$ is positive is not applicable to this analysis since members will resort to moneylenders once the PCU charges higher than that charged by moneylenders.

**Sensitivity Analysis**

The aforementioned analysis is conducted in the case where the default rate is zero. This is consistent with the observation that there have been no defaults. However, there exists the possibility that members of the PCU will default as the group expands to serve more members and allow loans of larger sizes.
Assuming that the default rate is not zero, the PCU then maximizes the expected value of surplus $E(\pi)$. I assume that the possibility that members default ($p$) is a function of the interest rate charged on PCU borrowers ($r_L$) as done in Stiglitz’s study (1981). In order to find the expression for the $E(\pi)$ when the default rate is not zero, I have to find the surplus when everyone defaults ($\pi_{\text{default}}$) and the surplus when no one defaults ($\pi_{\text{non-default}}$).

First, we need to find the function for the loss to the PCU when all members default. We assume that people will default in the very first period because they want to avoid paying the interest as well as the principal, so that their benefits from defaulting is maximized. Once everyone defaults, the PCU will take over all the savings and will have to borrow from the bank to compensate for the defaulted lending. They also have to pay the fixed cost, $E$. The PCU does not have to pay the operating cost since it pays its employees based on profit. However, realistically, it should be noted that if everyone does default, what will happen normally is that the Credit Union will go out of business since banks will not issue loans to the Credit Union to compensate default lending. If this is the case, then the profit of the credit union is zero.

The function for the PCU profit based on the condition that the PCU does not go out of business is then:

$$
\pi_{\text{default}} = -(L - S) - r_{DM} (L - S) - E.
$$

(25)

Assuming the worst scenario in which PCU lends everyone the maximum loan cap of $(1 + \gamma_{CU})S$, the profit becomes:

$$
\pi_{\text{default}} = -(1 + r_{DM})\gamma_{CU}S - E
$$

(26)
The expected profit is then:

$$E(\pi) = (1 - p)\pi_{\text{non-default}} + p\pi_{\text{default}}$$

$$E(\pi) = \frac{(1 - p)}{1 + c} \left[ a(r_L - r_{DM})(r_{LM} - r_L) + r_{DM}S - E \right] + p \left[ -(1 + r_{DM})\gamma_{CU}S - E \right] \quad (27)$$

To find the optimal interest rate that maximizes expected profit, we differentiate (27) and set it to zero. The solution is:

$$r^*_L = \frac{r_{LM} + r_{DM}}{2} \quad (28)$$

This is the same profit maximizing solution as when the default rate is zero. This is not surprising because it implies that the PCU should try to maximize its profit by lending to people who do not default. It should charge the highest interest rate that still attracts people to borrow from the PCU. Because the solution for optimal rate does not depend on the size of the community, it should not be surprising to find that the PCU should lend at the same rate even if it loses some of the customers who might default.

In the case that the PCU is also oriented towards borrowers with $\lambda \neq 0$, the objective function becomes:

$$\max_{r_L} \lambda \cdot \text{NGL} + \frac{(1-p)}{1+c} \left[ a(r_L - r_{DM})(r_{LM} - r_L) + r_{DM}S - E \right] + p \left[ -(1 + r_{DM})\gamma_{CU}S - E \right]$$

$$\quad (29)$$

Differentiating the above equation with respect to $r_L$, the optimal interest rate solution is
\[ r_{L}^{*} = \frac{1}{2} \left( \frac{r_{DM} - r_{LM}}{1 - p (1 + c)} \right) + r_{LM} \]  

(30)

The optimal interest rate decreases from the case where we have no default. This is because the probability of default reduces the effect of profit in the objective function, by putting more weight on \( NGL \). By reducing the interest rate, the PCU favors those who are in good standing by increasing incentives for those who do not default.

However, there is a limit to this PCU strategy. The PCU can continue to reduce its profit only when it is sure that it does not operate at a loss. Setting (27) to zero, we find the break-even point, which is

\[
r_{L}^{\text{break-even}} = -\frac{1}{2} \left( \frac{r_{LM} - r_{DM}}{4} \right)^{2} - \frac{1}{\alpha} \left[ \frac{(1 + c)(1 + r_{DM}) P Y_{CU} S}{1 - p} - r_{DM} S + \left( \frac{1 + p c}{1 - p} \right) E \right] \]  

(31)

I will consider the case where the PCU has to raise its interest rate in order to compensate for default lending and show that doing so does not bring the profit back to the point where it is when there is no default. Therefore, raising an interest rate when the default rate is not zero does not return the level of profit to what it was initially.

I do so by setting (24) equal to (27) to find \( r_{L} \), which brings the profit back to the optimal profit when the default rate is zero. I find that there is no such solution. By altering its interest rate on loans, the PCU does not increase its profit in compensating for the money lost to people who default. However, in reality, when the PCU drives moneylenders out of business and becomes a monopoly in the credit market, the PCU could increase its interest rate without losing customers, simply because they would
have no alternative ways to borrow. One can hypothesize that this situation would not last long before moneylenders seize an opportunity to reenter the market.

Another sensitivity analysis that I conduct is to test for the optimal rate the PCU should charge if moneylenders increase their interest rates. When $r_{LM}$ increases, the optimal interest rate $r_L$ should increase if the PCU is acting as a profit maximizer with $\lambda = 0$. In reality, the interest rate charged by moneylenders $r_{LM}$ is in the range of 0.10 – 0.20. The aforementioned analysis takes the value of $r_{LM}$ as 0.10 because, in the long run, competition from the PCU will drive moneylenders to the lower limit of 0.10. Under the case where $\lambda = 0$, the maximum rate that PCU can charge is 0.104. Therefore, the range of $r_L$ is 0.054-0.104. In other words, when moneylenders which are the only alternative of credit suppliers raise the interest rate $r_{LM}$, the rate charged by the credit union can be raised to maximize its surplus.

V. QUALITATIVE DATA ANALYSIS

The data used in this paper are the data from a single savings group that formed a credit union with 160 household members who are exclusively migrant workers in Thailand over the period 2007--2011. The data are generated bi-weekly. I chose this savings group because it has the greatest number of members and extends over the longest period. From looking at the data, the default rate has been zero since the onset of the program. In this section, I would like to conduct a qualitative analysis of what mechanisms that are adopted by PCU to influence people’s financial behaviors, leading to a zero default rate. First, I will review the eight mechanisms that the PCU adopted. However, the zero default rate is not the sole indicator of the PCU’s success
in helping people to discipline themselves so as to service loans. For this reason, I will review the rates of savings withdrawal and loan renewal to see if people have truly become well-disciplined in their financial behavior through the tools that the PCU has used.

1. Mechanisms adopted
The PCU has adopted the following methods when dealing with migrant workers without any forms of identification card.

- Making repayment public
- Requiring savings as collateral and issuing loans proportional to savings
- Fully denying access to future loans to those who default
- Using progressive lending
- Targeting women
- Educating pre-members on financial literacy
- Capping a loan size
- Imposing frequent repayment schedules and a short period of repayment

Public Repayment
The first method used by the PCU to ensure against default is to make repayment information public. Members of the PCU meet bi-weekly to transact, whether the transactions involve repaying loans, depositing money or taking out loans. Pattanarak uses social stigma avoidance by having this collective action as a tool to ensure repayment. This serves to increase the disutility, $-A_{social} - s - \frac{NGL}{r_{discount}}$, members obtain when they do not pay back the loan because they lose their social capital, $A_{social}$.
which is larger when transactions occur in public. Also by meeting regularly at scheduled locations and times, this credit union can reduce some transaction costs.

At the same time, committee officers can elicit some information about borrowers, mitigating problems arising from asymmetric information. Group meetings can also facilitate education and training, which can be helpful for members with little business knowledge through providing people with a platform to exchange knowledge and learn more about one another. In other words, being a credit union member also serves to increase your social capital because of the frequent meetings that strengthens social ties. This also allows for group monitoring which serves informally to motivate people to pay back their loans.

Requiring savings as collateral

The second mechanism that Pattanarak has been using to insure repayment is requiring financial collateral from members’ savings. The Credit Union can secure repayment through allowing borrowers to build up financial assets used as loan collateral. Borrowers have to show that they can save regularly for a certain period of time before being eligible for loans. The size of loan that can be taken out by borrowers must be contingent upon the size of their savings. Deposits can be used as collateral, which minimizes the full extent of the default for the Credit Union. In assisting members to build financial collateral, the PCU encourages members’ commitment through its loyalty savings program. Those who choose to participate in this program have to deposit a certain amount of money and cannot withdraw their deposits until the year ends. However, those facing credit constraints have some flexibility in their saving plan and do not have to participate in this program. If
members decide not to pay back their loans, they will lose all of their savings in the Credit Union. Because savings is migrant workers’ the only source of financial security, members of the Credit Union will put much effort into paying back their loans.

Another reason why such a savings contract contributes to a zero default rate is that it serves as a tool to automatically select loan sizes for members with different levels of wealth. The assumption is that if members have more, they save more. Therefore, people with more savings who are financially better off should be able to borrow more. Otherwise, the loan offered from the credit union might be meaningless to the one who is better off. At the same time, those who save less should take smaller loans so that they do not have difficulties in repaying their loans.

**Fully denying access to future loans to those who default**

The third method that the PCU uses to enforce repayment is imposing social sanctions on those who default by denying them any access to future financing, thereby making defaulting more costly to borrowers. Such a mechanism is effective especially for this community. Because of their status as migrant workers, they have to live within the proximity of the border region and cannot travel to other cities. The lack of opportunity outside of this village serves to increase the present value of each member’s net gain on loan ($\frac{NGL}{r_{discount}}$). Therefore, the disutility of defaulting, $-A_{social} - \delta_i - \frac{NGL}{r_{discount}}$, is high.
This might seem to be a stringent protocol. However, since the relationship with the PCU is trust-based in that any migrant worker is eligible to become a member of the PCU without having an identification card, it is necessary to have a serious penalty that can be imposed on defaulting.

**Using Progressive Lending**

The fourth method adopted is to use progressive lending which refers to the practice of promising larger loans for individuals in good standing. A progressive lending scheme increases the opportunity cost of non-repayment and thus discourages strategic defaulting. According to the model proposed in the previous section, progressive lending serves to reduce the disutility of repayment,

\[ -r_i L_i - L_i + a \ln((1 + \gamma_{cu}) s_i + \delta t_s) + b. \]

From the model, we assume that people’s utility increases with loan size and how much people can take out in loans is proportional to their savings. Moreover, the proportion increases with the period of time that the person remains in good loan standing, \( \delta t_s \). Therefore, progressive lending serves to increase the utility of repayment because people are able to obtain larger loan. This mechanism not only reduces the disutility of repayment, but also increases member’s net gain on the loan \( \frac{NGL_i}{r_{discount}} \).

**Targeting women**

The fifth method that the PCU uses to operate its savings group is targeting women. During the PCU’s initial years, the focus was on recruiting women members. Based on the Pattanarak volunteers’ experiences, women in the village are those who tend to take responsibility for money issues, seek credit, and pay back loans, while men are
busy working and earning money. In addition, women tend to have access to fewer alternative sources of credit and household money is not treated as a common resource within the family, which gives rise to gender-specific credit constraints.

From the interviews with Pattanarack staff members, I learned that most of the customers of moneylenders are men, and this serves as evidence supporting the argument that men have greater access to credit supply. Accordingly, during the recruiting period, the Pattanarack volunteers made some adjustments to their working strategies and targeted women. Currently, 70% of members are women. As shown in Morduch and Armendariz’ research, women tend to be more reliable customers of microfinance institutions and easier to find because they tend to work near home and have fewer ways to escape from social pressure. Since women tend to be much more sensitive to hostility of fellow members when they are not in good standing, the social sanction is quite effective.

*Educating pre-members on financial literacy*

The sixth method that the PCU adopts is paying regular monthly visits to households in the village to introduce the savings group’s idea and creating a survey to assess their needs for loans and savings accounts. The volunteers help answer the questions and concerns that potential members have. Such volunteers are well accepted in the village for their role in working with villagers on health and environmental issues. The strategy used by these volunteers is that they focus first on savings rather than credit provision. This approach helps put people on a firm financial foundation on which to join a credit union. Instead of launching the PCU as a full-fledged microcredit institution during the initial stage, volunteers make sure first that people know how to save and discipline themselves financially. During monthly visits to the
villagers’ households, volunteers help educate potential members in financial literacy and explain the need for their collaboration to keep the savings group up and running. Once potential members are judged ready to participate in the savings group, Pattanarak launches the savings group, which later evolves to become a credit union.

**Capping a loan size**

The seventh method adopted by the PCU is capping the loan amount at 20,000 Baht which is equivalent to 700 USD. The initial purpose of this limit was to prevent any deficits in the pooled account. However, such a rule has an implicit effect on the size of loans that people seek. Due to such a cap, people usually resort to the credit union for consumption smoothing purposes rather than for investment in their small businesses. When people borrow to cover daily expenditures, there is a lower risk associated with this. By comparison, when people borrow to start a small business, there is a greater risk involved due to inability to repay if the business fails. Moreover, with small loans, there is lower incentive for people to strategically default. The net disutility of defaulting, \(-A_{social} - s_i \cdot \frac{NLGL_i}{r_{discount}}\), is so high that people will find ways to make repayment. Also, small-sized loan makes it affordable for people to repay and thus reduces the risk that members are unable to pay back their loans.

**Imposing frequent repayment schedules and a short period of repayment**

The eighth method used is frequent repayment installments and short repayment periods. With consumers’ loans, it is usually the practice for the borrower to pay in several installments, whereas this is not the case with business loans. The adoption of this scheme decreases the amount of risk because it introduces a regular and steady
payment. Another reason why repayment should be scheduled this way is that
creditors or credit officers can get to know their clients better through frequent
meetings to pay off debts. This creates an early warning system so that credit officers
can foresee any problems in repayment through personal relationships and regular
monitoring. This system also screens for borrowers who are more likely to pay back
their loans because borrowers who would like to use their loans to finance their
investments, with frequent repayment installment, households must have some other
streams of cash flow upon which they can draw in order to frequently pay back their
loans. This is also an effective tool practiced by the credit union to insure members’
financial responsibility. The short periods for which members can retain their loans
does not allow them to spend their earnings on wasteful purchases. Frequent
repayment contracts match repayment schedules to incomes of cash members’
households. This way, the loan function as savings because they are regularly
deducted from people’s monthly incomes.

However, the PCU differentiates itself from other microfinance institutions by opting
out of the group-lending method. Group lending refers to individuals arranging to get
together to obtain loans without collateral. Loans are made individually to borrowers
with joint responsibility. Any group with one member defaulting will be denied credit
from lenders. Group lending has been widely used to utilize social ties to increase
people’s social capital that serves as collateral against their loans. However, the
problem with group lending is that it can create peer pressure that works against the
poorest and the most vulnerable populations. With the risk embedded in the contract
due to joint responsibility rendered by the fact that a borrower is not only at risk for
defaulting but also faces risk that his/her partner will default, members are under pressure to monitor one another closely, and this adds to monitoring cost.

All these unique characteristics help explain the zero default rate as well as why the PCU’s methods have been successful for this group of borrowers who cannot obtain formal services from the financial institutions.

2. Withdrawal rate and loan renewal rate

The zero default rate taken alone, however, is not a clear indicator of the PCU’s success in adopting the aforementioned mechanisms to enforce repayment. Other indicators that we should look at include withdrawal rate and loan renewal rate to see if the PCU approach really influences people’s financial behaviors in ways that drive the default rate to zero. There have been cases where people just resort to their savings to pay back their loans. By withdrawing some of the deposits to cover loan repayment, members of the Credit Union still do not change their financial behaviors. By looking at the withdrawal rate, I am able to gain some insights into how people manage their repayment schedules.

According to the data between the years 2007 and 2010, we see that the withdrawal schedules of clients of the PCU have not matched closely with repayment schedules. On average, members of the PCU withdraw 2-3 times a year. In general, the amount withdrawn is usually small- as small as 20 Baht or 0.5 USD for each transaction, with the maximum withdrawal of 1,500 Baht (50 USD). This is not enough to cover loan repayment. From interviewing the PCU staff members, I learned that the PCU clients tend to only withdraw from their savings in case of emergencies and not to repay their
loans. This seems to support my early findings that people are capable of managing their finance because they never have to resort to savings to make loan repayment.

The low withdrawal rate can be attributed to the financial literacy program that the PCU has established, which goes hand in hand with the bi-weekly meetings for repayment and borrowing. When the PCU members need money, the PCU staff encourages members not to withdraw but to take out loans. This is because the PCU members will obtain dividends distributed proportionally to the number of their shares based on how much they save. The actual cost of withdrawing is higher than perceived because members who withdraw will lower their shares and thus obtain lower dividends at the end of the year. The cost of borrowing is similarly lower than perceived because the dividends that members receive annually are partially paid through interest.

However, when looking at the loan renewal rates, there have been cases in which the PCU members re-borrow their loans as they come due. Members of the PCU can continue borrowing the principal as long as they pay the interest and the total amount borrowed is lower than the cap set by the credit union, which is determined by their savings. Therefore, if people are still in need of such loans, they may decide to re-borrow the same amount with no fees incurred. The conclusion is that, in many cases, the loan repayment period of three months set by the PCU does not match with people’s desired loan maturity. Those who re-borrow their loans need more time to make repayment.
This scenario of re-borrowing provides an insight in the effectiveness of the short-term frequent repayments adopted by the PCU to keep the default rate low. The evidence of loan renewal demonstrates that people need more time to be able to pay back the loans. The PCU offers its borrowers a protocol to discipline themselves through closely monitoring them. By requiring members to be present at the repayment meeting, PCU borrowers are kept in check. Despite people’s longer loan maturity, they eventually pay back the loans in full and avoid default.

VI. FURTHER RECOMMENDATIONS

The PCU serves as an example of a self-help group that is linked to a bank in an arrangement to provide basic financial services to the underserved population. Even though members are given access to a savings instrument and lending option, they have to make an extra effort to join the group in order to receive the services that they should have been able to access directly with the Thai identification cards. Such efforts, which are present obstacles, include attending the bi-weekly meetings, saving regularly to prove their credibility and completely trusting the third party—the credit union—to handle their money. On a governmental level, therefore, there needs to be intervention through regulations to construct a more transparent and efficient, as well as a more accessible, system for this underserved population.

The current system provides no formalized way for migrant workers to directly prove their identities and become official customers of the banks. The PCU is currently operating on what is primarily a trust-based system. If we were to replicate the PCU operating model, we would have to find the way to regulate the system in order to prevent any frauds that can potentially arise from the loopholes in the trust-based
system. There needs to be some way to protect the rights of the poor in case any staff members merely abscond with the money. To allow systems similar to the PCU to function in a broader scale, regulators need to come up with ways to protect stakeholders.

One way to regulate the microcredit system is to clearly define in what type of businesses or activities an organization such as the PCU can engage. Currently, there is no separate category for non-bank financial services organizations in the microfinance sector. In order to provide an environment conducive to the growth of non-bank institutions, there needs to be a specific definition of such an organization to allow for proper regulation.

However, with regulations not yet in place and the aforementioned cost placed upon members and service providers, a loan and savings instrument provision through microcredit institutions or credit union is the second best mechanism to help the poor access financial services. The optimal way is to require banks or financial institutions to interact directly with migrant workers. This can be done by having the PCU make some arrangement with banks to authorize non-Thai citizens to open bank accounts when members become familiar with financial services and demonstrate their ability to make loan repayments or to save sufficient funds.

Financial services include not only access to loans or savings accounts, but also incorporate money transfer services that should complement the ongoing efforts by the PCU. The initiative by the post office of Thailand to allow migrant workers to transfer remittances through the money order service is one example of how the
institution can extend the much-needed services to the underserved populations to increase access to the overall financial services.

VII. CONCLUSION

This study is a continuation of my field work, started in the summer of 2008, to provide efficient and reliable remittance transfer services for undocumented and documented migrant workers in Thailand. My fellowship partner and I were able to persuade Thailand post to enact the policy that recognizes migrant workers without national Thai identification cards as users of their money-order service. During the project, we were able to gain some exposure to the financial exclusion problem facing this population and learned about the initiatives by the Pattanarak foundation, located at the Sangkhaburi district by Thailand-Burma border, to help migrant workers access basic financial services by pooling resources within the village to form savings groups which have evolved into credit cooperatives.

The objective of this paper is to analyze if such a system as the PCU can satisfy the needs among the poor populations. In doing this, I analyze the effectiveness of the credit union mechanisms by investigating different mechanisms adopted by the PCU to change people’s financial behaviors and verify if a rate that the Credit Union charges its borrowers is optimal. I achieve this by modifying a financial model of a credit union and testing the optimality of the loan rate based on the assumptions of the PCU orientation. I also conduct a qualitative analysis of the PCU unique characteristics which include requiring financial collateral, making repayment public, utilizing social sanction, practicing progressive lending, imposing short and frequent
repayment installments and encouraging people to maintain their savings in order to receive dividends.

From looking at the data from 2007—2011 that comprise each member’s bi-weekly savings, withdrawals and loans, monthly interest rate charged on loan and annual dividends, the default rate has been zero with the average of 3 withdrawals each year by different members and the average of 2 to 3 loan renewals. These indirect mechanisms that the PCU adopted have worked well in terms of keeping the default rate at zero and minimizing the withdrawal rate, even though a person’s desired loan maturity seem longer than that provided by the PCU. Based on my analysis of the PCU’s practices—specifically, my findings that it has a zero default rate and members maintain their savings and borrow primarily for consumption smoothing purposes—in this suggests that the PCU supports legitimate financial services that are highly valued by the migrant communities that it serves.

However, I find that even though the loan rate that the PCU currently offers is lower than what moneylenders charge, the PCU is charging a less than the optimal rate to maximize its profit, the behavior claimed as the objective for the PCU. In fact, the PCU is undercharging its borrowers. I conduct a further analysis and find that if we assume that the rate currently charged by the PCU is optimal, PCU is indeed not a single surplus maximizer. It values the surplus provided directly to its borrowers to a certain extent with the weight on borrowers’ net gain on loans as 0.345 rather than zero, which the staff advance as their social mission.
The findings of my study also indicate that participation in the PCU is the first step for migrant workers to access basic financial services. Since the system operates on a trust basis, it can prove to be challenging for the programs to scale up to service more people. Despite the high costs of meeting regularly and showing that they are credit-worthy, members of the PCU have proven that, given the opportunity to borrow and save regularly, they undoubtedly can become reliable clients of formal financial institutions. The government, therefore, should try to formalize such a system so that the rights of people in this segment of the population who have been underserved thus far on a basis of trust alone are well protected now and in the future. Alternatively, banks and the PCU should make some arrangement to authorize members of PCU to become formal clients of the bank to allow for direct and transparent transactions.
APPENDIX A

This appendix presents the derivation of the reduced form of the optimal loan interest rate that PCU should charge its borrowers.

From (21), the objective function of PCU is:

\[ \max_{r_L} \lambda \cdot NGL + \pi \]  \hspace{1cm} (A1)

where

\[ NGL = (r_{LM} - r_L) \cdot L \]  \hspace{1cm} (A2)

\[ L = \alpha (r_{LM} - r_L) \]  \hspace{1cm} (A3)

and

\[ \pi = r_L L - r_S S - r_{DM} D - C \pi - E \]  \hspace{1cm} (A4)

Substituting (A2), (A3) and (A4) in (A1), and differentiating the objective function with respect to \( r_L \) in order to maximize value to members’ participation, I get:

\[ \frac{d\lambda NGL}{dr_L} = -2 \cdot \alpha \cdot \lambda \cdot (r_{LM} - r_L) \]  \hspace{1cm} (A5)

\[ \frac{d\pi}{dr_L} = \frac{\alpha}{1 + C} \left[ -2 \cdot r_L + r_{LM} + r_{DM} \right] \]  \hspace{1cm} (A6)

Therefore, the derivative of objective function with respect to \( r_L \) becomes:

\[ \frac{df}{dr_L} = -2 \cdot \alpha \cdot \lambda \cdot (r_{LM} - r_L) + \frac{\alpha}{1 + C} \left[ -2 \cdot r_L + r_{LM} + r_{DM} \right] \]  \hspace{1cm} (A7)

To maximize the value to members’ participation, we have to set (A7) = 0.

By doing this, we get:

\[ \left( -2 \cdot \lambda + \frac{2}{1 + C} \right) (r_{LM} - r_L) - \frac{r_{DM} + r_{LM}}{1 + C} = 0 \]  \hspace{1cm} (A8)

From (A8), we are able to find the reduced form of \( r_L \).
\[ r_L = \frac{1}{2} \frac{(r_{DM} - r_{LM})}{1 - \lambda \cdot (1 + C) + r_{LM}} \]  

(A9)

**APPENDIX B**

To find the point where \( r_L \) will have to be higher in order to prevent PCU from operating on loss, we have to find \( r_L \) at the break-even point. Setting (27) to zero, we get

\[ E(\pi) = \frac{(1-p)}{1+c} \left[ \alpha (r_L - r_{DM})(r_{LM} - r_L) + r_{DM}S - E \right] + p \left[ -(1+r_{DM})\gamma_{CU}S - E \right] = 0 \]

\[ \left\{ \frac{(1-p)\alpha}{1+c} \right\} r_L^2 + \left\{ \frac{\alpha(1-p)(r_{LM} + r_{DM})}{1+c} \right\} r_L + \left\{ -\frac{(1-p)}{1+c} \alpha r_{DM} r_{LM} + \left\{ \frac{(1-p)}{1+c} r_{DM} - p(1+r_{DM})\gamma_{CU} \right\} S - \frac{(1+pc)}{1+c} E \right\} = 0 \]  

(B1)

Solving (B1) using quadratic formula, we get

\[ r_L^{\text{break-even}} = \frac{r_{LM} + r_{DM}}{2} - \sqrt{\frac{(r_{LM} - r_{DM})^2}{4} - \frac{1}{\alpha} \left\{ \frac{(1+c)(1+r_{DM})p\gamma_{CU}S}{1-p} - r_{DM}S + \frac{(1+pc)}{1-p} E \right\}} \]  

(B2)

I ignore the other formula because the break-even interest rate should be the lower bound of the operation and should be less than the optimal interest rate shown by (28).
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* The raw data used in this paper are available upon request. Please contact Kittiprapha Jivasantikarn at jobj@stanford.edu.