

# **Does the Village Fund Matter in Thailand?**

**By**

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## 1. Introduction

In 2001, the government of Thailand launched the Thailand Village and Urban Revolving Fund (TVF) program. The TVF program provides a million baht (about \$22,500) to every village and urban community in Thailand as working capital for locally-run rotating credit associations.<sup>1</sup> The objective is to stimulate the rural economy by targeting new activities such as processing and packaging that are not traditionally financed under the existing financial arrangements.

Thailand has almost 74,000 villages and over 4,500 urban (including military) communities, so the total injection of capital into the economy envisaged by the TVF proposal amounted to 78 billion baht, equivalent to about \$1.75 billion. The program was put into place rapidly. By the end of May 2005 the TVF committees had lent a total of 259 billion baht (\$6.9 billion at an exchange rate of Baht 37.6/\$) to 17.8 million borrowers (some of whom borrowed more than once). This represents an average loan of \$387. The total repayment of principal amounted to 168 billion baht, leaving outstanding principal of 91 billion baht. Rarely, if ever, has an effort been made to direct so much money so quickly into locally-run micro-credit.

The TVF represents a policy experiment on a grand scale. The TVF is not however the only major source of credit. The Bank for Agriculture and Agricultural Cooperatives (BAAC) has an extensive network of rural lending. The question is what additional role the TVF has played in Thailand. In this paper we propose to quantify the impact of the TVF on household income, expenditure, and assets. The impacts of TVF are compared and contrasted with those of BAAC. An impact evaluation of this type is needed both to help the government of Thailand determine whether the program should be expanded or revised, and to help governments of other countries determine whether they should introduce or expand similar microcredit schemes. More specifically, we are interested in answering the following three questions:

- a. What is the impact of the program on rural income diversification, and what is the net effect on income growth and asset accumulation?
- b. Who benefits from the TVF program, and in what way?

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<sup>1</sup> The average exchange rate during 2001 was Bht44.51/\$, which implies that a million baht are equivalent to \$22,468. The exchange rate as of mid-October 2006 was Bht37.57/\$, which would value a million baht at \$26,617.

- c. Does the TVF add value to existing village-level financial, including the extensive lending that is already done by the Bank for Agriculture and Agricultural Cooperatives (BAAC)?

Answers to these questions are necessary, although not sufficient, for undertaking a cost-benefit analysis that would determine whether the program is worth supporting.

We summarize the relevant details of the TVF program in Section 2, discuss the data employed in the impact evaluation in Section 3, set out the appropriate theory in Section 4, report the results in Section 5, and complete the paper with some conclusions, including suggestions for further research, in Section 6.

## **2. The Thailand Village Fund**

The Thailand Village Fund became operational very rapidly. Inaugurated in 2001, by 2002, Village and Urban Community Fund Committees (henceforth “Village Fund Committees”) had been formed in 92% of the villages and urban communities in Thailand and much of the money had been disbursed. By May 2005, 99.1% of all villages had a Village Fund in operation and 77.5 billion baht, representing 98.3% of the originally scheduled amount, had been distributed to Village Fund Committees (Arevart 2005).

Although the initial working capital came from the central government, the Village Funds are locally run, and have some discretion in setting interest rates, maximum loan amounts, and the terms of loans. The Village Fund Committees process loan applications; households borrow and repay with interest; and the money is lent out again. The Village Fund Committees do not handle money directly; this is done by a number of intermediaries, of which the most important are the Government Savings Bank (GSB), which operates mostly in urban areas, and the Bank for Agriculture and Agricultural Cooperatives (BAAC), which operates only in rural areas and semi-urban communities.

There are five steps that must be taken in order for a Village Fund to become operational:

- (a). The village first sets up a local committee to run the fund and to determine the lending criteria (interest rate, loan duration, maximum loan size, and objectives).

- (b) The properly-established committee then opens an account at the BAAC (which has about 700 branches) or another "facilitator", and the government deposits a million baht into the account.
- (c) The local Fund committee sifts through loan applications and determines who may borrow and under what conditions (interest, rate, duration, etc.).
- (d) The borrowers go to the BAAC (or other facilitator) to get access to the loans. Each borrower must open an account – the minimum balance, if it is at the BAAC, is 100 baht – to which their loan is transferred.
- (e) The borrower repays the loan with interest. This requires him or her to visit a BAAC branch (or that of another facilitator); the borrower typically deposits the repayment directly into the village fund account. The BAAC provides a regular listing of transactions to each Village Fund.

A number of rules govern the establishment and operating procedures of the committee: three quarters of the adults in the village must be present at the meeting where it is established; the committee should have about 15 members, half of them women; while there is some discretion about the amounts lent per loan, it should not generally exceed 20,000 baht and should never exceed 50,000 baht; the loans must charge a positive interest rate; and it is recommended that loans have at least two guarantors.

The government rates Village Funds on a variety of efficiency and “social” criteria; in any given year, those that are rated AAA are provided with a “bonus” of a further Bht100,000 to add to their working capital. In addition, Village Funds can borrow an additional million baht (or sometimes just half a million baht, see below) from the BAAC or other facilitator. The size of this additional loan - i.e. half a million, or a million - is determined by the BAAC using its own (banker's) criteria. Only Village Funds that are ranked 1<sup>st</sup> class or 2<sup>nd</sup> class by BAAC may borrow a million baht; the others (3<sup>rd</sup> class) may only borrow half a million baht. The BAAC says that about 1% of these loans are overdue. The BAAC thus rates the managerial efficiency and potential of VF Associations and is hoping gradually to withdraw from micro-lending by giving these village funds a space for competition to run village banks. The BAAC recognizes that Village Fund Committees

generally have an informational advantage in determining who is a good candidate for a loan.<sup>2</sup> Some of the more dynamic Village Funds are trying to become rural banks, which would potentially lead to an efficiency gain in that it would allow money to move from one village to another.

### **3. The Data**

The data for the impact evaluation come from the Socioeconomic Survey of 2004 (SES-2004). This survey interviewed 34,843 households (covering 116,444 people) throughout the country drawn from 2,044 municipal “blocks” and 1,596 villages in 808 districts. The data were collected in four rounds, spread throughout the year. The survey collected a wide variety of socio-economic data, including relatively detailed information on household income and expenditure. The SES survey used stratified random sampling with clustering; all the descriptive results presented in this paper apply the appropriate weights (unless otherwise indicated).

The summary statistics in Table 1 come from a special module that was included in the 2004 socioeconomic survey and that asked all adult members of households about their experience with the TVF. By 2004, a sixth of all adults had borrowed at least once from the VF, with higher proportions of borrowers among the poor (defined as those in the poorest quintile, as measured by expenditure per capita) and among those in rural areas. Adults in 31 percent of households had borrowed from the TVF by 2004.

Of those adults who did *not* borrow, less than one percent had been refused a TVF loan, although a further 4% thought that they would be turned down. On the other hand, over a quarter of non-borrowing adults said they had no need to borrow, and almost a third said that they did not want to go into debt. Poor households were less likely to indicate that they did not need to borrow, but more likely to be fearful to going into debt.

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<sup>2</sup> This process, however, could potentially squeeze out some existing borrowers who may have less access to BAAC loans, and yet not be able to get Village Fund loans for one reason or another. Moreover, some TVFs may be inefficient for the following reasons: (i) lending to unqualified borrowers; (ii) favoring committee members; (iii) extending loans that are larger than the limit (e.g., 50,000 baht); (iv) not insisting on repayment; (v) lower interest rates and (vi) lending for longer-than the allowed periods up to about six months.

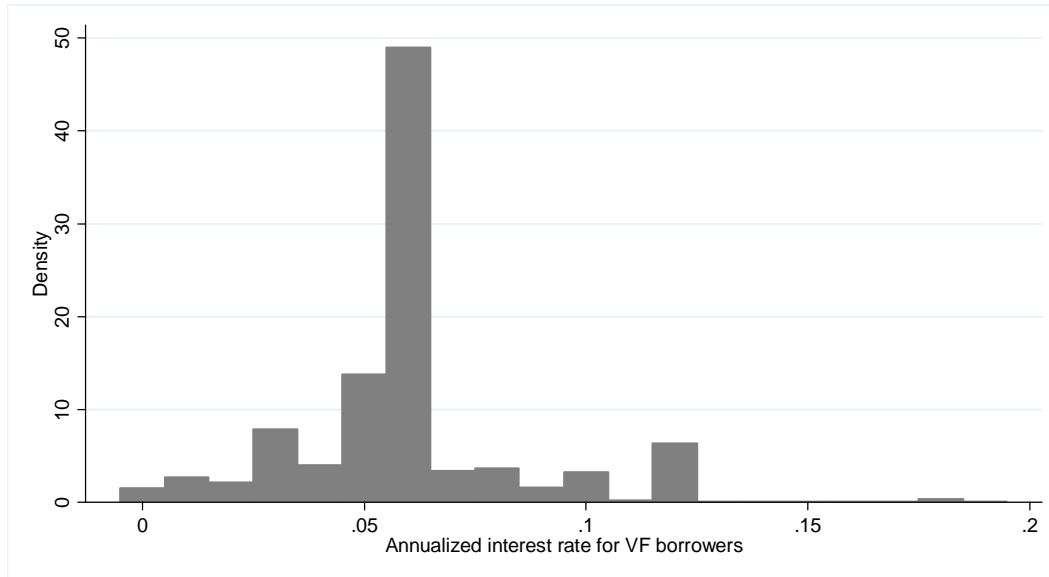
The average amount borrowed in the most recent TVF loan was 16,183 baht (about \$420), and this was only slightly less than the amount requested on average. The mean interest rate charged on TVF loans was 6.0 percent per year, but there was considerable variation, as Figure 1 shows; substantial numbers of Village Funds charged annual interest rates of 5, 3, or 12 percent. The interest rate paid by poor, or rural, borrowers was essentially the same, or perhaps slightly lower, than that paid by other adults.

Although the rhetoric surrounding the Village Fund program emphasized the importance of providing finance for processing and packaging, over half of all TVF borrowers said that they planned to use the money for relatively traditional agricultural purposes. This effect was even more marked among poor and rural borrowers. Borrowing is fungible, so this does not necessarily imply that spending on agricultural activities actually rose as a result of the implementation of the Village Fund program, but there is a dissonance between the reported uses of the borrowed funds and the original aspirations for the Fund.

Eight percent of TVF borrowers reported that they were overdue on repayments, and the proportion was similar for poor and rural households. However, a sixth of those who obtained TVF credit in turn borrowed elsewhere in order to repay their TVF loan. The interest rates charged by those alternative sources of credit were high, averaging 46 percent (on an annualized basis).

Despite the challenges that some faced in repaying the TVF loans, seven out of ten borrowers said that their economic situation had “improved” as a result of the program and just 2 percent said that it had worsened. However, less than a third of borrowers said that the TVF system should be left unchanged; substantial numbers wanted the loan amounts to be larger (34% of respondents), longer (34%), cheaper (37%), or to be focused more on the poor (25%).

Women were slightly less likely than men to have borrowed from the Village Fund: 15.5% of adult women borrowed from the fund, compared to the overall average of 16.6%. Women ask for, and receive, slightly smaller loans; pay a slightly higher interest rate; and are less likely to borrow to buy agricultural inputs or equipment. However, in most other respects, female borrowers are indistinguishable from male borrowers, as may be seen from the last column of Table 1.



**Figure1. Distribution by Adult Borrowers of Interest Rates Charged by Village Funds**

A 2005 survey undertaken in the northeast of Thailand by the Thailand Development Research Institute (IDRI) found that about 40% of households had borrowed from the TVF, and among those who borrowed, slightly over 90% were satisfied with the process. There is, however, some anecdotal evidence that in some cases the injection of credit has led villagers to borrow too much, leading to difficulties when the funds had to be repaid (Laohong 2006, Gearing 2001). There have also been reports of corruption in the administration of the TVF in some scores of villages.

#### **4. Measuring the Impact of the Village Fund Program**

It is not self-evident that an injection of credit into a rural economy will have a measurable impact, or a positive impact. If financial markets operate well – information is cheap and readily available, there are no policy distortions – then households should already have access to as much credit as they can productively use, and they would just substitute TVF credit for other sources of credit.

So for the TVF to have an impact, it must be predicated on the existence of market imperfections. This is not unreasonable: credit markets have well-known informational asymmetries that village-level revolving credit funds may be able to attenuate, given their (presumably) better knowledge about the ability of villager households to service loans. But the important point is that it

cannot be assumed, a priori, that the TVF will necessarily have a major impact on household welfare.

Any possible effects of the TVF are also likely to be attenuated by the fact that a number of credit schemes are already in place. In rural areas, the most important is the Bank for Agriculture and Agricultural Cooperatives (BAAC), which practices individual as well as group-based lending (mainly to support farming), mobilizes savings as part of financial intermediation, and is widely considered to be a successful rural finance institution (Yaron 1992, Fitchett 1999). Therefore it is legitimate to wonder whether the TVF has an added value to rural households that the BAAC could not provide. In other words, the relative effectiveness of both programs is an issue worth examining from the policy point of view. We return to this issue below.

But our first task is to measure the impact of the TVF program on outcome variables of interest. There are four sets of such variables:

- **Expenditure per capita.** The measure of expenditure available based on the SES-2004 data includes 56 categories of expenditure (and home production), including the rental value of housing, but does not include the rental value of the household's durable goods or vehicles (for lack of data).
- **Income per capita.** This measure includes 24 categories of income, and includes the rental value of housing (but not of durable goods).
- A number of measures of **household assets**, including whether the household has a washing machine, a VCR, or a motorized vehicle. The SES-2004 did not collect information on the total value of household assets.
- A variable ("**incrise**"), based on a question in the SES-2004 that asks whether household income over the previous year, relative to 2002,
  - i. Increased, but by less than 25% [17% of responses]
  - ii. Increased by 25-50% [4%]
  - iii. Increased more than 50% [0.5%]
  - iv. Decreased, but by less than 25% [12%]
  - v. Decreased by 25-50% [4%]
  - vi. Decreased more than 50% [0.9%]
  - vii. Remained relatively stable. [61%]

We have constructed a numerical variable from these categories, essentially by substituting midpoints (12.5%, 37.5%, 62.5%, etc.).



Our analysis aims to measure the impact of the TVF on each of these outcome variables. But now we are faced with a methodological problem: TVF borrowers do not represent a random sample of the households (or adults) surveyed in the Socioeconomic Survey of 2004.

In the absence of random assignment we have chosen to use a matching technique. The idea is to match each household that borrows from the TVF (a “treatment” case) with a household that is similar but does not borrow from the TVF (a “comparison” case), and then to compare the outcome variable of interest between the treatment group and the relevant comparators.

More formally, let

$X_i$  be a vector of pre-treatment covariates (such as age of head of household, location of household, and so on),

$Y_{i0}$  be the observed value of the outcome variable (such as expenditure) in the absence of the treatment,

$Y_{i1}$  be the observed value of the outcome variable for household  $i$  if it has been treated (i.e. it has borrowed from the TVF), and

$T_i$  be the treatment (equal to 1 if the household is treated, to 0 otherwise).

We want to measure  $\tau_i \equiv Y_{i1} - Y_{i0}$ , but this is impossible, because an individual is either in the treatment group (so we observe  $Y_{i1}$ ) or the comparison group (so we observe  $Y_{i0}$ ), but never in both. Suppose, however, that we are willing to assume that households are “assigned” randomly to the treatment group, once we have conditioned on the covariates – so, for instance, we believe that an old illiterate man in Village A who borrows is not otherwise different from an old illiterate man in Village A who does not borrow. Given this assumption of conditional independence (also known as “unconfoundedness” or “selection on observables”), then by a proposition first established by Rubin (1977; see too Dehejia and Wahba 2002), the average treatment effect ( $\tau|_{T=1}$ ) is identified and is equal to  $\tau|_{T=1, X}$  averaged over the distribution of  $X|_{T=1}$ . In other words, we can measure the average impact of the TVF by taking each borrower, finding an identical non-borrower (conditioned on the  $X$  covariates), computing the difference in the outcome variable of interest and taking its mean. In effect we are estimating  $\tau$  by using the observed value of  $Y_{i1}$  for each treated individual and an estimated value of  $Y_{i0}$  for each treated individual that is based on observing a similar, but non-treated, individual.

This procedure would be straightforward if there were just a few covariates, but in practice the problem is more tractable if we can create a summary measure of similarity in the form of a propensity score. Let  $p(X_i)$  be the probability that unit  $i$  be assigned to the treatment group, and define

$$p(X_i) \equiv \Pr(T_i = 1 | X_i) = E(T_i | X_i). \quad (1)$$

In practice, this probability – the propensity score – could be estimated using a logit or probit equation. Rosenbaum and Rubin (1983) show that

$$(Y_{i1}, Y_{i0}) \perp T_i | X_i \Rightarrow (Y_{i1}, Y_{i0}) \perp T_i | p(X_i). \quad (2)$$

This implies that conditional independence extends to the propensity score, so that treatment cases may be matched with comparison cases using just the propensity score.

Finally, Rosenbaum and Rubin (1983) show that

$$\tau |_{T=1} = E_{p(X)}[\tau |_{T=1, p(X)} | T_i = 1]. \quad (3)$$

This says that the average treatment effect may be obtained by computing the expected value of the difference in the outcome variable between each treated household and the perfectly matched comparison household (as matched using the propensity score). Perfect matching is not possible in reality, so in practice one needs to compute

$$\hat{\tau} |_{T=1} = \frac{1}{|N|} \sum_{i \in N} \left( Y_i - \frac{1}{|J_i|} \sum_{j \in J_i} Y_j \right), \quad (4)$$

where  $Y_i$  is the observed outcome for the  $i$ th individual who is treated and  $J_i$  is the set of comparators for  $i$ . The comparators may be chosen with replacement – the approach we take – in which case the bias is lower but the standard error higher than without replacement. With nearest neighbor matching one chooses the  $m$  closest comparators; in this paper we use  $m=1$ , but practice varies: some researchers prefer higher values of  $m$  (e.g. Abadie et al. 2001 favor  $m=4$ ), and others have used caliper matching (which uses all comparators within a given distance from the treatment), kernel matching, or Gaussian matching (both of which put more weight on closer comparators than those that are more distant). Dehejia and Wahba (2002) argue that the choice of matching mechanism is not as crucial as the proper estimation of the propensity scores.

## 5. Results

Broadly following an algorithm outlined by Dehejia and Wahba (2002), we first estimated propensity scores by applying a probit model to a limited number of covariates. We then sorted the observations by propensity score and divided them into strata sufficiently fine to ensure that there was no statistically significant difference in propensity scores between treated and non-treated households within each stratum. We confined this comparison to the area of “common support” – i.e. to those values of the propensity score bracketed by the highest and lowest estimated values for treated households – and typically needed between 15 and 21 strata. We then checked for the “balancing property,” which means that within each stratum we tested (using a 1% significance level) whether there was a difference in the covariates between the treated and non-treated group. The idea is that it is not enough for a comparator to have a propensity score similar to the treated household; the comparator should also have a relatively similar profile, so that the propensity score is similar because the underlying covariates are similar. Our initial propensity score models were not well balanced, so we added covariates (including dummy variables for Thailand’s 76 provinces) and we were able to generate models that were adequately balanced. For instance, when we confined our sample to rural areas, the propensity score model had 101 covariates, generated 15 strata, and produced 25 cases where covariates were not balanced. This is acceptable enough, given that at a one percent level of statistical significance one would expect to find, erroneously, about 15 cases of imbalance (false negatives).

A listing of the variables used in estimating the propensity scores is given in Table 2 (except for the provincial dummy variables). The first thing to note is that on average TVF borrowers are substantially poorer than those who do not borrow from the TVF, whether measured by monthly expenditure per capita (2,549 baht vs. 4,286 baht) or income per capita (3,209 baht vs. 6,088 baht), or by access to subsidized medical care (93% have a 30 baht medical card, vs. 77%). Compared to non-borrowers, those who borrow from the TVF are more than twice as likely to be farmers and to be self-employed, they are more likely to live in the Northeast region, they have larger families, and there are more earners per household. The important point here is that borrowers differ appreciably from non-borrowers, at least unless one conditions on the covariates.

The estimates of the probit propensity score equations are shown in Table 3; separate equations were estimated for the whole sample and for rural households. The equations fit sufficiently well and, as noted above, appear to be adequately balanced. One of the more influential variables is the inverse of the number of households per village (or block): The Thai Village Fund initially provided a fixed amount to every village, irrespective of size, which means that households living in a large village are less likely to have access to these loans than those in a small village. This effect shows clearly in the estimates of the propensity score equation reported in Table 3.

### ***Basic Results***

Given the propensity scores, it is then possible to match each treatment case with a nearby comparison case, and hence to estimate the impact of TVF borrowing. The results are summarized in Table 4. When propensity score matching is used with the full sample, TVF borrowing is associated with 5.5% more expenditure per capita and 4.4% more income per capita (columns (2) and (4) of Table 4). Translated to average increases (at the mean) this implies a rise in per capita spending of 200 baht per month and of income of 220 baht per month, which suggests that the effects of the borrowing are working via the effect on incomes. This is an important finding, because it implies that TVF loans are not, as has sometimes been suggested, merely functioning as consumer credit.

The increases reported in Table 4 are substantial but plausible. The boost to income represents an annualized rate of return of 17.6% on the amount borrowed (which averaged 16,183 baht).

However, these effects are only found when expenditure (or income) per capita is shown in log form. The use of the log of income (rather than its level) puts more emphasis to increases for poorer households, as the proportional effects (i.e. logs) are given more weight in these cases. The results show that TVF borrowing had no measurable effect on the subjective evaluation by households of whether their income had risen between 2002 and 2004 (the *incrise* variable).

Much of the effect of TVF borrowing appears to work through farm income. Again using the full sample, VF borrowing is associated with a 40% increase in monthly *farm* income (when using logs), or a monthly increase in income of 108 baht (using levels). There is also a substantial rise in non-farm income, when measured in log form (but not when measured in levels). These results suggest that it is farmers who are most able or willing to put TVF credit to productive use.

### ***Checking Robustness***

How robust are these findings? There are a number of possible ways to check for robustness. One approach is to confine the sample to rural households only (Table 4). This makes relatively little difference to the results: TVF borrowing is associated with a rise in expenditure per capita of 5.3% (compared with 5.5% for the full sample) and an increase in farm income per capita of 44% (compared with 40%). The overall income effect does appear to be slightly stronger (5.1% instead of 4.4%), suggesting that TVF lending has a larger productive impact in rural areas.

The propensity score results reported so far are based on an equation that includes dummy variables for the 76 provinces covered by the survey. A more parsimonious specification would use dummy variables only for the five main regions of Thailand. When we do this, TVF borrowing is associated with a 6.0% increase in per capita spending, compared to 5.5% in the case where provincial dummy variables are used (see Table 4). Our results are thus robust to this part of the specification of the underlying model.

In Table 5 we present some additional checks of the effect of TVF borrowing on (the log of) expenditure per capita. Our basic approach has been to estimate a propensity score equation and then to use nearest neighbor matching that compares each treated household (i.e. each TVF borrower) with the nearest untreated household. This shows a 5.5% increase in per capita income and is statistically significant, whether one uses the classical t-statistic ( $t=4.43$ ) or a bootstrapped version ( $t=5.11$ ), as rows 1 and 2 of Table 5 show. It is also possible to apply nearest-neighbor matching stratum by stratum and then take the weighted average effect, which shows a 4.8% rise in expenditure per capita for TVF borrowers (row 3 of Table 5). An alternative to nearest-neighbor matching is to compare each treated household with more than one neighbor, but putting more

weight on near neighbors. Basing these weights on an Epanechnikov kernel we find the impact to TVF borrowing on expenditure per capita to be 5.0% and when the weights are based on a Gaussian kernel the impact is estimated to be 2.5% (see Table 5, rows 4 and 5). These results are broadly consistent with one another.

One other interesting exercise is presented in Table 5. We divided households into quintiles based on the levels of expenditure per capita, and then applied propensity score matching (with a single nearest neighbor) to each category. The striking result is that the impact of TVF borrowing is only statistically significant for the poorest quintile, and there the effect is substantial (an expenditure increase of 6.3%). It would thus be appropriate to categorize the TVF policy as clearly “pro-poor.”

A somewhat different check on the robustness of our results is to match treatment households with non-treatment comparators using *direct* nearest neighbor matching rather than first estimating propensity scores. It is not clear that direct matching represents an improvement, even in principle, over propensity-score matching, and it is computationally intensive, but if both approaches give similar results then one can have more confidence in the conclusions. The results, for households living in rural areas, are shown in Table 6 and show that while TVF borrowing is associated with a 4.5% increase in per capita spending as measured using propensity score matching, the effect is half as strong using direct matching, with an increase of 2.7% if the direct match is based on a single nearest neighbor or 1.9% if the five nearest matches are used. These effects are, however, all statistically significant at conventional levels.

Our fundamental interest is in measuring the impact of the Thailand Village Fund on the wellbeing of households. We have measured this using expenditure (or income) per capita. But it might also be expected that TVF borrowing would have an effect on the accumulation of household assets. It is not possible to measure household gross or net assets using the SES-2004 data, but there is a listing of the major physical assets, of which some of the most important are given in Table 7. There we see, for instance, that 64% of all households surveyed had a phone; the rate was 59% for TVF borrowers and 67% for non-borrowers. We then used our propensity-score matching and found that, for instance, phone ownership among TVF borrowers was 5.7 percentage points higher than among comparable non-borrowers. Similar effects were found for VCRs, fridges, washing machines, and motorized transport, but not for Internet use or the number of installed light

bulbs, where the differences were not statistically significant. This suggests that TVF borrowing was widely used to get improved access to consumer and producer durables, despite the fact that few households reported that this was the ostensible purpose of their TVF borrowing.

The most rigorous study to date of the impact of the TVF (Kaboski and Townsend (2005) as reported in Townsend 2006) uses data from the 2003 round of a panel of 960 households that Robert Townsend and his colleagues have been following for a number of years in four provinces of Thailand. Although the sample size is relatively small, the survey is rich in detail on household financial assets and transactions. Their most striking finding is that the proportion of household credit coming from “formal” sources (including the TVF) jumped from 37% in 2001 to 69% in 2002, and was accompanied by little reduction in the use of other credit; in other words, at least as of 2003, TVF credit supplemented rather than replaced existing sources of credit. This is consistent with our finding of a positive impact on expenditure and income of the Thailand Village Fund.

In order to measure the effect of TVF borrowing on the outcome variables of interest, Kaboski and Townsend (2006) used an instrumental variables approach, and checked for robustness by applying a variety of econometric specifications (levels, changes, and estimates with and without outliers). They found that greater use of the TVF was associated with somewhat higher levels of household expenditure, and perhaps an increase in income. Again, this is consistent with our findings, although we detect a stronger effect on income, working through farm income.

Kaboski and Townsend also find that TVF borrowing is associated with an apparent reduction in net household assets. This might seem surprising, but could be due to mismeasurement (a farmer might have invested in drainage or field leveling, and this might not be picked up in survey questions), or because better access to credit reduces the need to hold assets, or because households overborrowed.

### ***The Bank for Agriculture and Agricultural Cooperatives***

As stated earlier, the TVF is not the only, or even necessarily the most important, source of credit for Thai households. The BAAC has an extensive network of rural lending, which extend credit and other services to the rural people. Of the households covered by the 2004 socioeconomic survey,

23% borrowed from the TVF only,  
15% borrowed from both the TVF and BAAC, and  
6% borrowed from the BAAC only.

These figures differ slightly from those presented earlier because they only refer to the two most important loans incurred by any given household. But the fact that many households borrow both from the TVF and the BAAC raises the possibility that our earlier results may be picking up the effect of BAAC borrowing and attributing it to TVF borrowing. We therefore applied our propensity score matching approach to borrowing from the BAAC, and report the results in Table 8. In passing we note that for each row we had to estimate separate propensity-score equations had to be estimated. From Table 8 it is clear that those who borrow from the BAAC are slightly poorer, and substantially more dependent on farm income, than TVF borrowers.

The first point to note is that, based on the results of the propensity-score matching analysis set out in Table 8, borrowing from the BAAC, with or without other loans, is associated with substantially higher expenditure per capita (+6.5%) and income per capita (+6.1%). This effect is comparable in magnitude to that of borrowing from the TVF (expenditure per capita rises 5.5%, income per capita by 4.4%).

But the most striking finding is that the combination of borrowing from the BAAC and TVF has particularly powerful effects, and is associated with 9.1% higher expenditure and 8.5% higher income. Loans from these two sources appear to be complementary. A plausible interpretation is that many households, particularly farm households, are credit constrained, even if they borrow from the BAAC; the TVF, by relaxing these constraints, enables them to boost their incomes. It is noteworthy that borrowing from the BAAC but not TVF, or from the TVF but not BAAC, has a small and only marginally significant effect on expenditure levels and an even weaker effect on incomes.

## **6. Conclusions and Directions for Further Research**

This study of the impact of the Thailand Village Fund is based entirely on data from the socio-economic survey of 2004, undertaken less than three years after the TVF was launched. In the absence of random assignment, we were obliged to use a quasi-experimental method – we chose



propensity-score matching – to quantify the effect of the TVF on outcome variables. The procedure has generated reasonable results: the Thailand Village Fund does appear to have an impact and it is quite strong, raising expenditures by 5.5% and income by 4.4%. This finding is robust to different specifications of the propensity score matching, and holds even when direct matching is used.

Further investigation shows a number of interesting patterns. First, most of the effect of TVF borrowing is concentrated in the poorest quintile of the population (as measured by expenditure per capita), making the program markedly pro-poor. Thus the TVF probably has a role in the arsenal of tools that the Thai government may want in its poverty reduction policies.

Second, the effect of the TVF appears to work most convincingly through its influence on farm income, suggesting that it is credit-constrained farmers who have been best able to put the loans to productive use. This is not what the designers of the Fund had envisaged; instead they had expected that it would boost household-level non-farm enterprise. We speculate that the short-term nature of the TVF loans makes them suitable for farmers – they allow for the financing of inputs during a crop cycle – but are not long-term enough to be very useful for most of the other remunerative activities that households might initiate.

The third interesting finding is that there are synergies between TVF and BAAC loans; borrowing from one or the other has little discernible impact on incomes or even expenditure, in contrast to the large impact associated with borrowing from both sources. This has some important practical implications. The BAAC should be slow to withdraw from village-level lending, even if it is tempted to do so by a perception that the TVF can fill the gap; or alternatively, the BAAC should be sure to channel enough resources via the TVF to allow it to fill the gap adequately. Our results also suggest that if the government wants to expand the TVF, the most productive approach would be to target poorer farming communities, and to link TVF and BAAC financing.

Our results do not represent the last word on the impact of the Thai Village Fund program. Our results could usefully be checked further using panel data. An effort was made in the 2004 socioeconomic survey to re-survey all of the 6,309 rural households that were interviewed in rounds 2 and 3 of the 2002 socioeconomic survey. Of this total, 5,755 households were located and re-

surveyed in 2004. This is useful, because although the BAAC was in full operation in 2002 and 2004, the TVF was only just gathering steam in 2002.

In the future it would be desirable, in the context of on-going socioeconomic surveys, to collect fuller data on the stock of household assets, on durable goods consumption, and on the sources and conditions attached to sources of credit other than the TVF. This would allow one to undertake a more complete impact analysis, with a more complete set of outcome variables. It would be valuable to determine whether the impact of the TVF weakens over time, a finding that is common elsewhere (e.g. Chen et al. 2006; Khandker 2005).

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<b>Table 1</b>		<b>Summary of Use of Village Fund, by Adults, 2004</b>			
		<b>All</b>	<b>Poorest fifth*</b>	<b>Rural</b>	<b>Female</b>
Number of observations (unweighted)		80,950	13,180	30,892	43,916
Expenditure per capita (baht/month)		3,398	1,060	2,578	3,427
Income per capita (baht/month)		4,717	1,455	3,345	4,745
Did you obtain at least one VF loan since 2002? (% saying yes)		16.6	20.0	21.5	15.5
Why did you not obtain a loan?	Number of observations	69,486	10,820	24,547	38,035
	<i>Applied but was refused (%)</i>	0.7	1.1	0.8	0.7
	<i>No need (%)</i>	28.5	16.0	25.1	28.7
	<i>Believed would be refused (%)</i>	4.1	4.4	3.9	3.9
	<i>Too expensive (%)</i>	0.2	0.4	0.2	0.2
	<i>Did not find guarantors (%)</i>	0.9	1.1	0.7	0.8
	<i>Did not like to be in debt (%)</i>	29.5	37.8	33.1	29.7
	<i>Don't know about TVF (%)</i>	7.7	3.1	2.6	7.7
	<i>Other (%)</i>	28.0	36.1	33.4	28.0
	<i>VF is not available (%)</i>	0.5	0.0	0.1	0.4
How much money did you ask to borrow in this loan? (Baht)		17,183	18,236	17,438	16,340
How much did you actually borrow in this loan? (Baht)		16,183	17,312	16,462	15,322
Annualized interest rate on the VF loan (%)		6.0	5.8	5.9	6.1
What was the main (true) objective for obtaining this loan	Number of observations	11,250	2,354	6,298	5,881
	<i>Buy agricultural equipment/inputs (%)</i>	39.5	44.9	42.2	35.3
	<i>Buy animals (for sale/use) (%)</i>	9.7	12.3	10.4	8.4
	<i>Buy agricultural land (%)</i>	1.7	1.6	1.8	1.7
	<i>Buy non-farm business equipment/inputs (%)</i>	10.3	3.6	8.9	11.6
	<i>Business construction (%)</i>	3.6	1.3	3.0	4.2
	<i>Buy consumer durables (%)</i>	1.4	2.0	1.3	1.6
	<i>Improve dwelling (%)</i>	4.8	4.3	4.4	4.6
	<i>School fees (%)</i>	4.0	2.1	3.4	4.7
	<i>Health treatment (%)</i>	0.6	0.7	0.6	0.9
	<i>Ceremonies (%)</i>	0.2	0.2	0.2	0.2
	<i>On-lending (%)</i>	0.8	0.7	0.8	0.9
	<i>Other (%)</i>	23.4	27.1	23.0	25.6
	<i>Not reported (%)</i>	0.2	0.1	0.2	0.2
Were you overdue in repaying this loan? (% saying yes)		7.7	7.9	7.5	7.9
Did you borrow from somewhere else in order to repay this loan? (% saying yes)		16.1	18.9	16.6	16.8
What rate of interest did you have to pay on this other loan? (% per annum)		46.0	44.2	43.9	49.6
How did this	<i>Improved (%)</i>	71.1	70.9	71.7	70.9

loan change	<i>Unchanged (%)</i>	27.0	27.2	26.4	27.0
your economic	<i>Worsened (%)</i>				
situation		1.9	2.0	1.9	2.2
Why was your	Number of observations	249	62	96	123
loan	<i>No funds left (%)</i>	39.1	40.5	43.7	32.5
application	<i>Application incomplete (%)</i>	8.2	8	8.6	5.2
refused?	<i>No guarantors (%)</i>	19.2	19.8	14.9	20.8
	<i>Other (%)</i>	30.9	31.6	30.4	40.0
	<i>Not reported or unknown (%)</i>	2.6	0.1	2.5	1.5
If refused, did you obtain a loan from other sources					
instead? (% saying yes)		45.0	38.7	46.7	52.6
How should	<i>No changes needed</i>	30.2	28.3	31.5	30.4
the TVF	<i>No guarantors</i>	13.4	12.5	12.3	13.1
system be	<i>Higher loan amounts</i>	33.6	36.7	36.3	33.1
changed? (%	<i>Longer repayment periods</i>	33.9	40.8	38.2	33.4
mentioning	<i>Lower interest/grants</i>	36.9	40.9	38.5	37.1
item)	<i>Repayment in kind</i>	4.9	6.5	5.5	5.0
	<i>Should give money only to the poorest</i>	25.2	22.3	21.5	25.6
	<i>Other</i>	6.7	5.2	5.3	6.8
Note. Unit of observation is an adult (aged 20 or older). * Poorest quintile as measured by expenditure per capita.					
Source: Thailand Socioeconomic Survey 2004.					

**Table 2. Summary of Variables Used in Propensity Score Analysis**

	Full sample		VF borrowers		Not VF borrowers	
	Mean	<i>Std. Dev.</i>	Mean	<i>Std. Dev.</i>	Mean	<i>Std. Dev.</i>
Does household borrow from VF? (Yes=1)	0.38	0.49	1.00	-	-	-
Age of head (in years)	49.67	14.84	50.37	13.16	49.24	15.78
Educational level of head (in years)	7.09	4.39	6.09	3.18	7.71	4.89
Head of household is male (yes=1)	0.70	0.46	0.74	0.44	0.68	0.47
Number of adult males in household	1.09	0.71	1.17	0.71	1.04	0.71
Number of adult females in household	1.27	0.70	1.33	0.63	1.24	0.74
Number of males working in agriculture	0.45	0.65	0.68	0.70	0.30	0.58
Number of males working in industry	0.20	0.46	0.17	0.43	0.22	0.48
Number of males working in trade	0.13	0.39	0.10	0.34	0.15	0.41
Number of males working in services	0.20	0.44	0.15	0.39	0.23	0.47
Number of females working in agriculture	0.44	0.60	0.69	0.64	0.28	0.52
Number of females working in industry	0.17	0.42	0.15	0.39	0.19	0.44
Number of females working in trade	0.13	0.39	0.11	0.35	0.15	0.41

Number of females working in services	0.21	0.48	0.15	0.39	0.26	0.52
Municipal area (yes=1)	0.33	0.47	0.12	0.33	0.45	0.50
Age of household head (in years), squared	2,688	1,556	2,710	1,381	2,674	1,655
Educational level of head (in years), squared	69.55	83.77	47.18	54.97	83.43	94.82
One-person household	0.10	0.31	0.04	0.20	0.14	0.35
Household with two parents	0.67	0.47	0.75	0.43	0.61	0.49
Household with one parent	0.10	0.30	0.09	0.29	0.11	0.31
Household has 30 baht medical card	0.83	0.38	0.93	0.26	0.77	0.42
Household gets lunch or food subsidy	0.24	0.43	0.34	0.48	0.18	0.38
Village fund is available in village	0.81	0.39	0.99	0.07	0.70	0.46
Size of household	3.45	1.66	3.84	1.61	3.20	1.65
Head of household is self-employed	0.48	0.50	0.65	0.48	0.38	0.48
Head of household is an employee	0.34	0.47	0.23	0.42	0.41	0.49
Head of household has another employment	0.18	0.39	0.12	0.33	0.22	0.41
Number of earners in household	1.94	1.07	2.21	1.03	1.77	1.07
<b>Memo: Outcome variables</b>						
Household current income, baht/capita per month	4,987	7,119	3,209	3,385	6,088	8,474
Household consumption, baht/capita per month	3,622	4,190	2,549	2,410	4,286	4,865
Household farm income, baht/capita per month	522	1,809	785	2,048	360	1,623
Household non-farm income, baht/capita per month	3,964	6,780	2,065	2,855	5,140	8,110
Percentage rise in income since 2002	0.55	15.09	0.32	16.32	0.70	14.27
Number of observations	34,843		10,985		23,858	

**Source:** Thailand socioeconomic survey, 2004.

**Note:** Means are weighted to take structure of sampling into account.

**Table 3. Estimated Propensity Score Equations for Full Sample and for Rural Areas**

	Full sample		Rural households only	
	Coefficient	p-value	Coefficient	p-value
Age of head (in years)	0.009	0.01	0.030	0.00
Educational level of head (in years)	0.102	0.00	0.106	0.00
Head of household is male (yes=1)	-0.038	0.14	-0.051	0.20
Number of adult males in household	-0.164	0.00	-0.063	0.08
Number of adult females in household	-0.138	0.00	-0.074	0.02
Number of males working in agriculture	-0.049	0.36	-0.152	0.07
Number of males working in industry	-0.097	0.08	-0.124	0.15
Number of males working in trade	-0.229	0.00	-0.172	0.05
Number of males working in services	-0.081	0.14	-0.028	0.75
Number of females working in agriculture	0.044	0.41	0.030	0.71
Number of females working in industry	-0.112	0.04	-0.132	0.12
Number of females working in trade	-0.174	0.00	-0.077	0.37
Number of females working in services	-0.107	0.04	-0.033	0.70
Municipal area (yes=1)	-0.360	0.00		
Province 1 (metro Bangkok)	-0.091	0.40		
province2	-0.099	0.46	-0.363	0.07
province3	-0.019	0.88	-0.203	0.24
...				
province74	-0.082	0.45	-0.173	0.23
province75	0.057	0.66	-0.059	0.72
Age of household head (in years), squared	0.000	0.00	0.000	0.00
Educational level of head (in years), squared	-0.006	0.00	-0.006	0.00
One-person household	-0.263	0.00	-0.324	0.00
Household with two parents	0.067	0.03	0.064	0.17
Household with one parent	-0.100	0.00	-0.132	0.01
Household has 30 baht medical card	0.193	0.00	0.123	0.01
Household gets lunch or food subsidy	0.043	0.05	0.116	0.00
Village fund is available in village	1.587	0.00	2.622	0.00
Size of household	0.103	0.00	0.090	0.00
Head of household is self-employed	-2.399	0.00	-5.599	0.00
Head of household is an employee	-2.633	0.00	-5.929	0.00
Head of household has another form of employment	-2.450	0.00	-5.859	0.00
Number of earners in household	0.245	0.00	0.196	0.01
1/(number of households per village or block)	33.315	0.00	65.242	0.00
Constant	-0.672	0.22	0.956	.
<b>Memo items:</b>				
Number of observations	34,752		12,848	
Number of variables (excluding constant)	103		101	
Pseudo R2	0.234		0.174	

Region of common support	0.0004	0.9947	0.0006	1.0000
Number of strata	21		15	
Number of cases not balanced	71		25	

**Source:** Thailand Socioeconomic Survey, 2004.

**Table 4. Summary of Propensity Score Matching results**

	Expend- iture per capita	Ln(exp- penditure per capita)	Income per capita	Ln(inco- me per capita)	Farm income per capita	Ln(farm income per capita)*	Non- farm income per capita	Ln(non- farm income per capita)*	% rise in income since 2002 ("inrise ")
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Means</b>									
Whole sample	3,622	7.88	4,987	8.08	522	3.71	3,964	7.32	0.55
VF borrowers	2,549	7.63	3,209	7.79	785	5.27	2,065	6.77	0.32
Not VF borrowers	4,286	8.04	6,088	8.26	360	2.74	5,140	7.66	0.70
<b>Matched comparisons</b>									
<b>Full sample, provincial dummies</b>									
VF-not VF	67.9	<b>0.055</b>	-42.6	<b>0.044</b>	107.9	<b>0.398</b>	-127.8	<b>0.093</b>	0.286
t [n=10,957]	1.16	4.43	-0.36	2.96	2.97	7.11	-1.11	2.66	1.01
<b>Rural households only</b>									
VF-not VF	5.2	<b>0.053</b>	5.7	<b>0.051</b>	166.1	<b>0.438</b>	-77.7	<b>0.096</b>	
t [n=6,051]	0.39	2.96	0.38	2.75		5.01		1.88	
<b>All, regional dummies</b>									
VF-not VF	63.0	<b>0.060</b>							
t [n=10,957]	1.01	4.92							

**Source:** Based on data from Thailand Socioeconomic Survey, 2004

**Notes:** \* Minimum value of ln(farm income per capita) set equal to 0. For 18,863 cases with positive farm income, log difference was 0.509 (t=21.94).

\*\* Minimum value of ln(non-farm income per capita) set equal to 0. For 34,053 cases with positive non-farm income, log difference was -0.783 (t=-52.71).



**Table 5. Robustness Checks for Propensity Score Matching: Ln(Expenditure per capita)**

		TVF – not TVF	t-statistic
Propensity Score Matching			
1	Nearest neighbor (base case)	<b>0.055</b>	4.43
2	Nearest Neighbor with bootstrapped standard errors (100 replications)	0.055	5.11
3	Stratification matching	0.048	6.06
4	Epanechnikov kernel matching	0.050	
5	Gaussian kernel matching	0.025	
Effects by expenditure per capita quintile			
	Quintile 1 (poorest)	<b>0.063</b>	5.98
	Quintile 2	<b>0.005</b>	1.131
	Quintile 3	<b>-0.002</b>	-0.372
	Quintile 4	<b>0.008</b>	1.572
	Quintile 5 (richest)	<b>-0.021</b>	-0.982

**Source:** Based on data from Thailand Socioeconomic Survey, 2004

**Table 6. Propensity Score Matching and Direct Nearest Neighbor Matching Compared**

		Sample average treatment effect for ln(expenditure per capita)	Standard Error	z (or t)	p-value (two-tailed)
Propensity score matching		<b>0.045</b>	0.021	2.11	
Direct matching, using inverse variance as the weighting matrix	1 nearest neighbor match	<b>0.027</b>	0.013	2.11	0.035
	5 nearest neighbor matches	<b>0.019</b>	0.011	1.69	0.092

**Note:** Number of observations is 12,858. The sample was confined to rural households and used regional (not provincial) dummy variables, for computational tractability.

**Table 7. The Effect of TVF Borrowing on Household Durable Assets (as per the Propensity-Matching Model)**

	Sample means			Matched comparisons	
	Whole sample	VF borrowers	Non-VF borrowers	VF - non VF	T
HH has VCR	0.60	0.61	0.60	0.039	4.21
HH has fridge	0.80	0.82	0.78	0.050	7.02
HH has washing machine	0.36	0.33	0.39	0.051	5.56
HH has phone	0.64	0.59	0.67	0.057	6.35
HH has motorized transport	0.74	0.84	0.68	0.049	6.79
HH uses Internet	0.18	0.12	0.21	0.011	1.60
No. of lightbulbs in HH	5.89	5.41	6.18	0.085	1.15

**Source:** Based on data from Thailand Socioeconomic Survey 2004.

**Note:** In every case, number of treatment households is 10,957, with a total sample of 34,843. The sample means are weighted to reflect the sampling used by the SES-2004.

**Table 8. Propensity Score Matching Results for BAAC vs. TVF**

	Expenditure per capita	Ln(expenditure per capita)	Income per capita	Ln(income per capita)	Ln(farm income per capita)	Ln(non-farm income per capita)	Number of observations
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Means</b>							
Whole sample	3,622	7.88	4,987	8.08	3.71	7.32	34,843
Borrow from TVF	2,549	7.63	3,209	7.79	5.27	6.77	10,985
Borrow from TVF but not BAAC	2,724	7.68	3,396	7.83	4.63	7.00	7,268
Borrow from BAAC	2,378	7.58	3,107	7.75	6.05	6.45	5,624
Borrow from BAAC but not TVF	2,584	7.62	3,517	7.80	5.65	6.48	1,907
Borrow from BAAC and TVF	2,292	7.56	2,934	7.73	6.21	6.43	3,717
Borrow from neither TVF nor BAAC	4,486	8.09	6,390	8.31	2.40	7.80	21,951
<b>Matched Comparisons</b>							
<b>Borrow from BAAC (and possibly others)</b>							
BAAC-not BAAC	124.2	<b>0.065</b>	25.8	<b>0.061</b>	<b>0.584*</b>	<b>-0.05**</b>	34,752
t [n=5,614]	1.88	4.46	0.22	3.40	9.43	-1.07	
<b>Borrow from BAAC (but not from TVF)</b>							
BAAC-not BAAC	46.0	<b>0.036</b>	-29.0	<b>0.038</b>	<b>0.516</b>	<b>-0.123</b>	34,752

t [n=1,905]	0.15	1.67	-1.05	0.97	1.73	3.35	
<b>Borrow from TVF (and possibly others)</b>							
VF-not VF	67.9	<b>0.055</b>	-42.6	<b>0.044</b>	<b>0.398</b>	<b>0.093</b>	35,752
t [n=10,957]	1.16	4.43	-0.36	2.96	7.11	2.66	
<b>Borrow from TVF (but not from BAAC)</b>							
VF-not VF	9.4	<b>0.021</b>	-98.7	<b>0.015</b>	<b>0.102</b>	<b>0.116</b>	35,752
t [n=7,248]	0.15	1.67	-1.05	0.97	1.76	3.35	
<b>Borrow from TVC and BAAC</b>							
BAAC+VF-not BAAC or VF	190.4	<b>0.091</b>	150.2	<b>0.085</b>	<b>0.646</b>	<b>0.08</b>	27,870
t [n=3,709]	3.0	5.8	1.8	4.5	9.9	1.5	

**Source:** Based on data from Thailand Socioeconomic Survey, 2004

**Notes:** \* Minimum value of ln(farm income per capita) set equal to 0 in all cases. \*\* Minimum value of ln(non-farm income per capita) set equal to 0 in all cases. All the propensity score equations use dummy variables for the provinces, as well as the other variables listed in Table 2.

