The Government's Helping Hand:

A Study of Thailand's Agricultural Debt Moratorium

Senior Honors thesis
presented by

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to the Department of Economics
in partial fulfillment of
the requirements for
a Bachelor of Arts degree with Honors

Harvard College
Cambridge, Massachusetts

March 18, 2004

Acknowledgments

Abstract

This paper relates the empirical study on the effectiveness of Thailand's Agricultural Debt Moratorium Program (DMP). Under the DMP, small-scale farmers could reschedule their principle and interest repayments, or enter into a reduced-interest repayment scheme for a period of three years. The program came about as part of the government's effort to provide relief to farmers in times of economic tensions. The objective of the program, as put forth by the government, is to alleviate poverty among the agricultural households and use the period of relief to encourage structural changes in farmers' operations. Implemented in April 2001, the DMP is set to end in September 2004. This study therefore aims to evaluate the impact of the DMP on its participants as the program approaches its end. The analyses focus on the changes in consumption, asset accumulation, and savings of the participating households. The study uses panel data collected from 2001, when the DMP was just being implemented, and from 2003, when the program had completed two-thirds of its lifetime. Findings indicate that the DMP has fallen short of its objectives, and, after two years, has not had significant impact on its participants. Furthermore, conditions imposed by the program on its participants may have been detrimental to its own objectives.

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List of Abbreviations

The abbreviations used throughout this thesis and the relevant literature are presented below.

Abbreviation	Definition
BAAC	Bank for Agriculture and Agricultural Cooperatives
DMP	Debt Moratorium Program
MS	Debt Moratorium Scheme
RS	Debt Relief Scheme

Chapter 1

Introduction

This thesis is an attempt to evaluate the effectiveness of a specific government intervention in the rural and agricultural sectors of Thailand. In April 2001, the Thai government launched the Debt Moratorium Program (DMP), under which small-scale farmers could reschedule their principle and interest repayments, or enter a reduced-interest repayment scheme for a period of three years. The program came about in response to the accelerated decline in the agricultural sector following the Asian economic and financial crisis of 1997. Implemented through the network of the state-owned Bank of Agriculture and Agricultural Cooperatives (BAAC), the program aimed to provide relief to approximately two million farmers around the country. Broadly, this thesis investigates the effectiveness of governments' interventions in the rural financial environment; and specifically, it aims to evaluate the DMP against its motivation and stated objectives.

Because it is a relatively recent program, the DMP has not yet been extensively studied. As the program approaches its end in September 2004, little is known about how, and if, farmers have benefited from it. To date, no empirical analysis has been carried out on the program's effects on the Thai rural households. In general, empirical works that investigate government agricultural policies are underrepresented in existing literature. Furthermore, within the body of agricultural policy studies, there is a biased dichotomy. Agricultural policies are often evaluated in the macroeconomic

framework, with past studies focusing on interventions in the forms of taxation and export controls. This thesis is one of few empirical works that evaluate the microeconomic consequences of government interventions in agriculture.

By and large, there is little consensus on the role of the government in financial markets. In cases where the market is missing, such as in the rural environment, the federal role of spearheading the early stages of market development is more obvious. In the later stages, however, government intervention is more controversial, particularly when it threatens to weaken the rural financial market in the long run. These same concerns have shrouded the DMP since its implementation. Opponents of the program fear that high-profile state involvement in a debt relief effort will set a bad precedent for future agricultural policies. Moreover, such state-endorsed loan deferral is likely to weaken the financial discipline of rural borrowers and undermine the long-run success of rural credit.

The primary finding of this thesis is that, after two years, the DMP has not affected rural households' welfare insomuch as can be evaluated from households' consumption growth, asset accumulation, or savings growth. There is some evidence, albeit inconclusive, that the program's restrictions on new borrowings may have had perverse effects on households' agricultural asset accumulation during the past two years. Secondary findings in this thesis reveal significant inequality among rural households and evidence that savings are a luxury good.

Although this thesis relates directly to the Debt Moratorium Program in Thailand, its results are pertinent to rural environments in developing countries in general, and the government's role in the rural financial market in particular. The author hopes her findings will contribute to the concluding remarks about the DMP as it comes to a close, impart policy implications for future decisions on similar government interventions, and provide a stepping-stone for other scholarly works in similar fields.

The remaining pages are organized as follows. Chapter 2 reviews current liter-

ature that relates to the central questions of this thesis. Chapter 3 gives a brief background about the Bank of Agriculture and Agricultural Cooperatives and details about the DMP. Chapter 4 presents the hypotheses and predictions of this study. Chapter 5 describes the data used in the empirical analysis. Chapter 6 discusses analytical methods and econometric specifications. Chapter 7 offers regression results and interpretations of the findings. And Chapter 8 gives concluding remarks.

Chapter 2

Review of Literature

The recent international attention given to grassroots approach to economic development has shifted development policies away from state-led interventions toward social works of non-government organizations (NGOs). But while government poverty alleviation programs are being increasingly criticized, there are relatively few studies in existing literature to substantiate or repudiate these criticisms.

The works reviewed here fall under three broad categories. The vastness of literature under these categories combined makes an exhaustive review impossible. Instead, this chapter focuses on the literature most pertinent to this thesis. The structure of this literature review is as follows: First, past impact assessment studies, the majority of which assess the effectiveness of microfinance programs, are discussed. A discussion of the literature exploring the theoretical framework concerning government intervention in the rural financial sector then follows. Finally, this chapter concludes with an examination of a Thai government report on the DMP, which motivates the primary question of this paper.

2.1 Impact Assessment Studies

A growing concern in impact assessment studies of various social programs is how to address the problem of non-random selection in study samples. In the imple-

mentation of such programs, non-random selection occurs at two levels: households' self-selection into programs, and programs' selection of geographic location. It is argued that households that choose to participate in certain programs are likely to be fundamentally different from those that choose not to participate. Similarly, since a program's placements are likely chosen based on certain attributes of those particular locations, villages with social programs may be fundamentally different from those without. These hidden attributes of programs' participants and placements, if unaccounted for, will lead to biased estimations of programs' impacts, and thus accrediting them with unwarranted success or failure.

Past impact studies that have attempted to address this problem of non-random household selection and program placement include Pitt and Khandker (1998), Morduch (1998), Coleman (1999), Kaboski and Townsend (2002), Khandker (2003), and Burgess and Pande (2003). The analytical methodology in this thesis follows many aspects of Kaboski and Townsend (2002) and Khandker (2003).

Pitt and Khandker (1998) used the maximum likelihood estimation approach on cross-sectional data to estimate impacts of group-based credit programs in Bangladesh on the different genders of participants. Using labor supply, children's schooling, expenditure, and assets as their outcome variables, Pitt and Khandker found that there is gender differentiation in benefits from these programs, and in general, the magnitudes of benefits are greater for women than for men. Morduch (1998), analyzing the same data as Pitt and Khandker (1998), investigated the impact of program eligibility rather than program participation in order to avoid self-selection biases. The average impact of group-based credit programs on their participants, using Morduch's method, is the estimated impact of eligibility weighted by the proportion of eligible households that were actually in the program. Morduch found some evidence of programs' effects on households' consumption smoothing, but maintains reservations on the effects of these programs on poverty reduction.

Studying microfinance programs in the northeast of Thailand, Coleman (1999) allowed for self-selection in both his treatment and control groups. Provision of financial access was then withheld from the latter until after the study was completed. Because self-selection was allowed in both groups, the difference between treatment and control households lied only in their access to financial services. Differences in the outcome variables between treatment and control groups then were attributable to the programs. Coleman concluded from his study that wealthier villagers were more likely to join microfinance programs, and the wealthiest benefited most from them.

Also in the context of Thailand, Kaboski and Townsend (2002) examined the general effects of microfinance institutions as well as the impacts of specific institutional policies on rural households. Rather than using households' welfare levels as the outcome variables, they investigated programs' effects on changes in welfare over the period of participation. They also controlled for endogeneity in their regressions by using programs' presence in the village as an instrument for participation, and including village-level variables to control for bias arising from the programs' placements. Kaboski and Townsend reported the importance of rural credit institutions in reducing the probability of households borrowing from informal moneylenders. They also found that programs that offer services such as training, flexible savings accounts, and emergency assistance help improve households' response to income shocks, while pledged savings accounts and training services positively affect households' asset growths.

An empirical impact assessment that relates more directly to successful government rural interventions is given by Burgess and Pande (2003). Burgess and Pande investigated the Indian social banking experiment that took place between 1977 and 1990. During this time period, the Indian Central Bank mandated that commercial banks wanting to expand their branches into locations with already-existing banks must first open four branches in other "un-banked" locations. Using instrumented

difference-in-differences approach, Burgess and Pande showed that this law led to greater financial expansion in rural areas where financial development had originally been backward. Their econometric estimates reveal higher incidence of poverty reduction in rural areas where branch expansion was high. While the authors made no claim about the transferability of their findings, their work shows evidence of rural banking as a mechanism for combating poverty, and their results "go some way towards counteracting the widespread pessimism which surround state intervention in rural credit markets" (19-20).

2.2   The Government's Role in the Rural Sector

A question that remains in spite of vast literature on rural development and finance is when and how governments can intervene. Stiglitz (1993) examined the role of the state in financial markets and identified major market failures that justify government intervention. He contends that market failures in the financial market are much more pervasive than in others, and thus certain government interventions in this market can improve the outcome of the economy. Two of the market failures he identified are particularly pertinent to the agricultural debt moratorium in Thailand. The first is the negative externality that financial disruptions exert on the economy. Citing the fact that bankruptcy is costly to the economy and could threaten the downfall of other institutions, Stiglitz argues that macroeconomic consequences of financial disruptions are an important rationale for the government's involvement. Second, large-scale risks can lead to the missing market problem, since private markets cannot handle macroeconomic risks of large magnitudes. In the case of Thailand, an imminent downfall of the agricultural sector, due to its size and its ability to absorb workers from the other sectors, would be extremely costly to the overall Thai economy. The uncertainties of agriculture and the high costs of acquiring information in rural areas

make the agricultural sector unattractive to private markets. Addressing problems within the sector often necessitates interventions by the government.

In Thailand, the government has always had some role in the rural financial sector. A state-owned institution like the Bank of Agriculture and Agricultural Cooperatives (BAAC), which offer below-market interest rates on loans, has had the benevolent role of crowding out the informal lenders in the rural areas. Tri-ratt and Charoenseang (2001)[1] observe that before 1966, informal lenders' credit share in the rural sector was as high as 90 percent. The expansion of the BAAC in the subsequent decades has greatly reduced the role of informal credit in the rural areas. Credit share from informal sources in the 1970s-1980s averaged about 50 percent, and this share was further reduced to 20 percent in the past decade. But in spite of the increased role of government's credit in rural areas, similar growths in commercial banks' networks have been rather limited. Thailand's rural credit market overall is still heavily segmented. Siamwalla et al. (1990) suggest that market segmentation and the difficulty commercial banks have in obtaining local information perpetuate the high costs of lending. Siamwalla et al. recommended that a key role for the government in improving the efficiency of the rural credit market is to tackle this problem of information asymmetry through enhancing the strengths of existing rural institutions.

Townsend (1995) studied of the financial systems in northern Thailand, and also found evidence for Pareto-improving government intervention. The field research conducted across ten northern villages revealed considerable inter- and intra-village variations, which affirms patterns of households' risk-sharing allocation contrary to the full risk-sharing Pareto optimal. This suggests the possibility of welfare-increasing government interventions. Townsend identified improvement of legal systems, for better contract enforcement, and better education of the village headmen as two possible such policies.

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[1]This study published in March 2001 by the *Chulalongkorn Review* was written in Thai. The author of this thesis is responsible for all mistakes in translation.

In a more theoretical proposal for government rural credit policies, Armendariz de Aghion et al. (2002) proposed that government programs should give potential participants a "menu of choices" with differing incentives to allow for self-selection into the most appropriate programs. Armendariz et al. argue that the choices would allow rural agents to select the programs that suit them best, and thus minimizing the distortions of incentives that usually arise from impositions of policies with limited flexibility. As will be discussed later, the structure of the DMP in Thailand is predicated upon this notion of choices with differing incentives.

2.3   DMP Progress Report

To date, the most comprehensive studies of the DMP are the program's progress reports released by the BAAC. These reports, based on studies carried out by BAAC officials, give figures on changes that have taken place within the households of participants. The February 2003 progress report used "quota sampling" to select 560 DMP participants from eight provinces in four regions of Thailand (BAAC, 2003, 4). In each province, two BAAC district branches were selected, and 35 participants were nominated by their respective branches to be in the study. The study reported progress of the DMP, surveys participants' opinions about the program, and identifies program inefficiencies. Statistical analysis in the study involved only mean and percentage calculations-the mean values of assets, net income, household consumption, and savings in the study sample, and the percentages of households that saw changes in these values. For example, the study reported that since the inception of the DMP, 42.26 percent of the households under one particular program scheme had higher levels of assets; also 42.26 percent had lower levels of assets; and the rest saw no change (BAAC, 2003, 35).

Although it is acknowledged that the main objective of the progress report of

the BAAC is to monitor the development of the DMP, and not to measure its impact, such a report reveals little information even about the progress of the program. The methodology of the study done for the report can be critiqued on the following grounds. First, the BAAC study excluded households that were not part of the DMP, and thus eliminated a basis for comparison between participants and non-participants. Second, sample selection based on households nominated made by BAAC branches did not ensure randomness of the sample pool studied. Therefore, the percentages found are unlikely to be representative of the proportion in the larger population. Third, percentages of households that have seen, for example, higher income, indicate nothing about the program's progress. Fluctuations in a household's welfare level are due to many factors, and the simple fact that the level has changed cannot be attributed to the DMP.

The evident shortcomings of this present study of the DMP beg the question of how an evaluative study of a government program may be improved. This thesis seeks to fill the gap that exists in Thailand's evaluative literature on government programs. It also seeks to contribute to the general body of agricultural policy studies, among which policy evaluations in the microeconomic framework are by and large underrepresented.

Chapter 3

Overview of the BAAC and the DMP

In order to properly study the DMP, it is first necessary to understand the BAAC's role in the development of Thailand's rural financial sector. This chapter outlines the history and influence of the BAAC and presents a full description of the DMP.

3.1 The Bank for Agricultural and Agricultural Cooperatives

The Bank of Agriculture and Agricultural Cooperatives (BAAC) was founded in 1966 to serve the financial needs of farmers and agricultural associations in Thailand. It is by far the largest network of rural financial institutions in the country, and has served as an important rural development arm for the government. As a financial institution, the BAAC has been privileged with a considerable degree of management autonomy. But as a state-owned agency, it also operates under the government's directives in implementing various agricultural advancement programs (Asian Development Bank, 2001).

The institution's clientele consists of farming households ranging from those at the poverty line[1] to those in the lower-middle income status. Due to the wide socio-

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[1] World Bank standard of USD 1 per day.

economic range of its clientele and its top-down management approach, the BAAC is not usually recognized as a microfinance institution. But the recent international focus on both the necessity and the feasibility of banking with the poor has nonetheless elevated the BAAC to prominence as a rural financial institution that lends to the agricultural sector (Yaron et al., 1997).

Key services offered by the BAAC include savings, credit, and payments and transfers of funds. Membership requirements and loan conditions are generally flexible. The bank accepts collateral in various forms, including land titles, government securities, savings deposits with the BAAC, and joint liability agreements. The BAAC offers short-, medium-, and long-term loans for different agricultural purposes. These loans are further classified into normal loans, special project loans, and loans under government initiatives. Loan interest rates vary according to the credit ratings of borrowers, ranging from 8 to 14 percent for individual farmers, and from 5.5 to 10.5 percent for agricultural cooperatives and farmers' organizations (BAAC, 2004). Further details about the BAAC loans are included in Tables A.1 and A.2.

Since its inception in 1966, the BAAC has undergone a rapid nationwide expansion. Its network currently covers 877 districts in 76 provinces, and serves approximately 91 percent of the Thai farming households (Asian Development Bank, 2001). The BAAC owes much of its stability and successful outreach efforts to the government's support. In 1975, the government passed a law requiring all commercial banks to invest at least five percent of their deposits in agriculture. The commercial banks could either engage directly in agricultural investment or they could channel their funds via the BAAC. In 1987, the five-percent obligation was increased to twenty percent. This legislation ensures that the BAAC has constant access to a steady source of funds and effectively transfers the cost of fund-mobilization from the government to commercial banks (Yaron et al., 1997, 119).

Historically, agriculture has been viewed as the backbone of the Thai economy.

Agricultural produce, such as rice, tapioca, maize, cassava, and rubber, formed a significant portion of Thailand's GDP until late 1970s. However, industry-biased economic policies pursued in the 1980s have greatly de-emphasized the importance of the agricultural sector. From 1951-1995, agricultural share in the country's GDP declined from 38 percent to around 10 percent (Mundlak et al., 2002). But while policies in the recent decades have largely neglected the agricultural sector, the majority of the Thai workforce is still engaged in agricultural activities. The large BAAC network thus provides an important channel through which rural development policies can be enacted.

3.2 Thailand's Agricultural Debt Moratorium

The current government, under the leadership of the Thai Rak Thai Party, came into power in January 2001. Among its policies aimed to alleviate poverty and create sustainable growth in the agricultural sector is a three-year debt moratorium promised to farmers aggrieved by continued repercussions of the Asian economic crisis. The Debt Moratorium Program (DMP) was launched on April 1, 2001, with its effective end set for September 30, 2004.

The application process for the DMP took place strictly between April 1 and June 30 of 2001. Eligibility criteria for a household were as follows. These three requirements were the only stipulations in the official eligibility criteria (Kotikula et al., 2001):

1. The household must be an existing member of the BAAC at the time the program begins;

2. The household cannot have more than Baht 100,000[2] in outstanding loans from the BAAC at the time the program begins; and

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[2]Approximately USD 2,272.7; in March 2001, USD 1 was approximately Baht 44 (Bangkok Bank of Thailand).

3. The household must never have gone through a legal proceeding with the BAAC regarding debt settlements.

As loan sizes are generally negatively correlated with a borrower's socio-economic status, the government chose the Baht 100,000 limit because it believed this amount would maximize the number of small- and medium-scale farmers eligible for the DMP (BAAC, 2003). Under these requirements, it was estimated that the DMP would extend to approximately half of the BAAC clients and one-third of its loan portfolio at the time (Asian Development Bank, 2001).

In applying to the DMP, eligible farmers selected to join under one of the following two options (BAAC, 2002):

1. The debt *moratorium scheme* (MS) – a deferral of interest and principle repayment for a period of up to three years; or

2. The debt *relief scheme* (RS) – a reduced-interest repayment scheme, in which farmers continue to repay their loans, but with a three percent reduction from their previous interest rates for up to three years.

Participants under the MS must forgo borrowing from the BAAC during the period of the moratorium, while those opting for the RS can continue to take out loans. Participants under the RS are also eligible to enter into government raffles for education or health insurance awards of up to Baht 100,000. Furthermore, throughout the duration of the DMP, RS participants with credit ratings higher than B have privileged access to emergency funds of up to Baht 30,000.

Schemes with differing incentives were offered so that participants could self-select into the scheme that yielded the optimum outcome for themselves, while costs to the government were minimized. Because the MS was the riskier and more costly scheme for the government, restrictions on new loans under the MS and incentives given to the RS were implemented in order to minimize moral hazard arising from less-troubled borrowers choosing to apply for the MS (Kotikula et al., 2001). While

official records suggest that these incentives have succeeded, the data used in this thesis reveal divergent statistics. This divergence will be discussed in Chapter 5.

Aside from the aforementioned differences, other DMP benefits are the same under both schemes. These benefits are summarized as follows (BAAC, 2002):

1. Upon the household's exit from the program or the program completion in September 2004, farmers under both schemes will resume repaying at their respective interest rates prior to joining the program.

2. To provide farmers with incentive to increase savings for eventual repayment, both MS and RS participants with savings deposits of up to Baht 50,000 were awarded a one-percent increase in deposit interest per annum.

3. As part of the DMP, households also receive access to "occupation rehabilitation programs," which allow farmers to seek counsel from government representatives on issues regarding farm improvements, income management, and marketing of produce. Furthermore, subsidized inputs are available for agricultural activities including livestock, fishery, and soil improvement.

4. Farmers that successfully repay and exit the DMP before its completion are awarded a credit rating upgrade, and will have continued access to the occupation rehabilitation programs. These programs were intended to help farmers constructively use the time period to increase their productivity.

Most generally, the DMP is a short-term program with long-term goals. The government has suggested that in the short run, the DMP would "*boost purchasing power of those given temporary relief from loan repayment,*" while allowing time for the farmers to "*improve and restructure their operations*" for increased productivity in the long run (Sonakul, 2001).

It is thus on these grounds that this thesis evaluates the impact of the DMP on the Thai rural households.

Chapter 4

Questions, Hypotheses, and Predictions

This chapter lays out the questions this thesis investigates, the hypotheses of the study, and finally, the author's predictions regarding the results of the study.

4.1 The Main Question

This purpose of this thesis is to answer the following question about the DMP that has thus far been inadequately addressed: How has the DMP affected its participating households?

This question is the main motivation of this thesis. As stated earlier, the DMP has been in effect for over two years; however, little is known about how, or if, the program has impacted its participants. The funds set aside for the DMP operations, which include compensation for the BAAC for the costs it bears in implementing the program, amount to Baht 7.7 billion per year (Kotikula et al., 2001). Although this figure constituted only 0.13 percent of the country's GDP in 2003[1], the public sector debt in the same year was as already high as 49 percent (Asian Development Bank, 2003). Evaluating the efficacy of programs such as the DMP is therefore vital to practicing sound fiscal policy.

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[1]Thailand's GDP in 2003 = Baht 5904.4 billion or USD 142.3 billion (Thailand Investor Service Center).

4.2   Hypotheses

The following hypotheses predicated upon the objectives of the DMP.

Hypothesis 1. *The DMP aims to temporarily alleviate the participant's burden of debt repayment. Since the household can defer repayment completely or repay at a reduced cost, the fund originally set aside for repayment can now be used for other purposes. Assuming that consumption is a normal good, an increase in the household's disposable income ought to increase its consumption. Controlling for differences in household characteristics, the effect of the DMP on the participant therefore is to increase its consumption as compared to non-participants.*

Hypothesis 2. *As part of the DMP, the farmers are "supervised and assisted [in the occupation rehabilitation programs] to help them improve and restructure their operations" (Sonakul, 2001). Farmers under the DMP have access to not only agricultural counseling, but also subsidized inputs. Since the DMP aims to encourage farmers to make meaningful investments that will result in greater long-term productivity, agricultural and business asset accumulation is higher for DMP participants than for non-participants.*

Hypothesis 3. *The one-percent increase in the BAAC deposit interest raises the cost of household consumption. Substitution effect predicts that the household will spend less and save more. However, the household also experiences the income effect from the increased disposable income. Since the increase in deposit interest is small compared to the decrease in repayment burden, income effect is expected to dominate and the DMP household increases both its consumption and savings.*

4.3 Predictions

Hypothesis 1 suggests that DMP participants should have increased their consumption spending due to higher disposable income. Since higher disposable income is the most direct effect of the DMP on its participant, this study predicts participants' higher consumption as an outcome of the program.

A case for the household's increased investment in its farm or business operations as a consequence of DMP participation is less strong. Hypothesis 2 relies the government's assumption that participants would use the three-year relief period productively. However, the BAAC progress report on the DMP revealed that the occupation rehabilitation programs have not thus far been successfully integrated into the DMP. According to the report, as many as 84.26 percent of MS participants and 83 percent of RS participants in the sample study have yet to take advantage of these occupation rehabilitation programs (BAAC, 2003, 59). These percentages suggest that the occupation rehabilitation programs have had limited outreach, and thus this study predicts that the DMP has not effected any significant changes in the farm or business investments of its participants.

In addition, this study predicts the effects of DMP participation on the household's savings with the BAAC to be insignificant for the following reasons. Households in the DMP are small- and medium-farmers, and thus their typical deposits with the BAAC are likely to be small. A one-percent increase in the interest rate on small deposits is unlikely to translate into substantial sums, and thus will not make this savings incentive attractive enough to alter the DMP households savings behavior.

Chapter 5

Data Description

This chapter presents details about the data used in the empirical analysis of this thesis, the variables selected for the study, and remarks about the discrepancies found among different data sources.

5.1 The Data Sets

The empirical work in this thesis makes use of household-level data that were gathered as part of the Townsend Thai Project. The first survey for the Townsend Thai Project was a large-scale socio-economic survey carried out from March to May 1997. The field study covered 2,880 households across four *changwats* (provinces) in two regions of Thailand – Chachoengsao and Lopburi in the semi-urban Central region; and Buriram and Sisaket in the more rural and poorer Northeast. The 2,880 households were selected at random – 15 households from each of the 192 villages sampled across the four *changwats*.[1] The annual re-surveys of the Townsend Thai Project are smaller surveys administered to 960 households – from 64 villages – in the original sample. Every year, the same 960 households are re-surveyed.

The econometric analysis in this thesis is based on data from two of the annual re-surveys – specifically data from the re-surveys of 2001 and 2003. Henceforth, these

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[1]For the sampling methodology of this first field survey (the Big Survey), see Binford, Lee, and Townsend (2001) and Paulson and Townsend (2001).

data will be collectively referred to as the Townsend Thai data, and individually as the 2001 data and the 2003 data. The data sets from these two years were chosen with specific regard to the study of the government program in question. The DMP went into effect in April 2001, and is due to end in September 2004. Therefore, the combination of the two data sets, one collected when the DMP was just being implemented and the other after the program has completed two-thirds of its lifetime, makes for a panel data set whose panels approximate "before" and "after" data in a natural experiment. Panel data of this form is particularly suitable for analyzing the effects of a "treatment" over time. In the case of this thesis, the treatment is households' participation in the DMP. The voluntary basis of DMP participation, however, gives rise to the non-random nature of treatment selection in this study sample. This selection problem is addressed using instrumental variables in the two-stage least squares approach. Further details are discussed in the Chapter 6.

5.2 The Variables

The two data sets used in this study contain a broad range of information, which includes household demographics, current income, total expenditure, savings, borrowings, and lendings, as well as asset holdings, cultivated land, and occupational history. It should be noted that data on several households were missing from the original sample size of 960. The 2001 data had 956 households whose entries were mostly complete. The 2003 data had 922 such households. The assets data unfortunately were less complete, and both data sets had only 779 to 824 households whose asset data were available.

The variables discussed below are those selected for the econometric analysis of the DMP's impact on households. They are categorized into outcome variables, control variables, and the explanatory variable of interest: program participation.

5.2.1   Outcome Variables

The three main outcome variables this thesis investigates are households' total yearly consumption, agricultural and business assets (business includes agri-business and shrimp farms), and savings with the BAAC. Their summary statistics are presented in Table 5.1. These variables were chosen because participation in the DMP should hypothetically affect their movements, as discussed in the previous chapter. Higher disposable income should lead DMP participants to increase their consumption. The occupation restructuring programs are also intended to aid farmers in farm improvements or business expansion. If farmers have indeed invested in these areas over the past two years of the DMP, changes in their agricultural and business assets should be evident. Lastly, the effect of the program on farmers' savings is investigated to determine if farmers increased their savings with the BAAC in response to the one-percent rise in deposit interest.

The total yearly consumption variable is constructed from data on a household's typical monthly expenditures on a set of items. These items include the following: house repairs; vehicle repairs; education; clothes; meals eaten away from home; consumption of grains, milk, meat, alcohol, tobacco, and gasoline for household usage; and expenditures on ceremonies. This thesis makes use of Jeong's method of calculating total yearly expenditure from the Townsend Thai Data (Jeong, 2002). Jeong used consumption data from the Thai Socio-Economic Survey (SES) and the monthly expenditures in the Townsend Thai data to create *changwat*-specific weights for each of the itemized monthly expenditures (Table A.3 presents these *changwat*-specific weights). A household's yearly consumption is the weighted sum of these monthly expenditures, multiplied by twelve.

Asset variables in the data are divided into agricultural, business, and household assets. The data sets provide the value of these assets as well as the year of their acquisition. Values of older assets are depreciated at a rate of 10 percent per annum

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Table 5.1: Summary of Outcome Variables

	2001			2003		
	Mean	S.D.	Obs.	Mean	S.D.	Obs.
Outcome Variables						
Total yearly consumption	73,429.91	85,468.24	956	78,368.31	101,145.90	917
Gross depreciated assets	1,419,435	2,586,122	793	1,452,824	4,161,342	779
-Agricultural	27,699.50	69,254.64	793	31,671.36	103,913.60	779
-Business	14,315.24	69,037.99	793	22,553.32	197,393.50	779
-Household	71,409.42	126,043.30	793	88,474.89	185,682.20	779
BAAC savings	3,433.60	23,115.71	956	3,584.55	17,610.24	920

from the time of their purchase.[2] Agricultural assets include tractors, mechanical ploughs and seed-sowing machines[3], sprinklers, threshing machines, rice mills, crop storage buildings, chicken coops, and livestock facilities. Business assets refer to major physical resources such as machinery, equipment, inventory, and buildings that are required for the business operation. Household assets include land and water vehicles, electronic appliances, regular and cellular telephones, and other appliances whose values exceed Baht 1,000.

The last outcome variable is households' savings with the BAAC. Other forms of savings are excluded because the savings incentive under the DMP only applies to BAAC savings accounts. Families without savings accounts with the BAAC have zero as their BAAC saving amount.

5.2.2 Control Variables

The control variables in this study incorporate individual household characteristics that directly and indirectly affect the outcome variables of interest. These variables are: 1) age of the household head; 2) gender of the household head; 3) number of household members; 4) net household income; 5) total amount of outstanding debt; 6)

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[2]The author is deeply grateful to Joseph P. Kaboski and Robert M. Townsend for their permission to use the asset variables of 2001 and 2003.

[3]Mechanical ploughs and seed-sowing machines are collectively referred to as "set" in the survey questionnaire.

ratio of outstanding debt to household gross income; 7) amount of cultivated land; 8) number of businesses that the household owns or partially owns; 9) dummy variable indicating if the household is situated in the Northeast; 10) dummy variable indicating if there are family members living away from the village. Summary statistics of these control variables are presented in Table 5.2.

The gender of the household head is a dummy variable which equals 1 if the household head is female. Household members are defined as those who lived and ate in the household for at least six of the twelve months leading up to the survey, and children studying away from home who were supported by members of the household. The net income is the household's income after deducting farm and business expenses during the twelve months leading up to the time the survey was administered. Cultivated land is measured in *rai*, which corresponds to approximately 2.5 acres. The Northeast dummy variable is included because the welfare level of the average Northeastern household differs quite significantly from the average central-region household. Lastly, the dummy variable of household members living away from the village is used as a proxy for the household's receipt of remittances.

Table 5.2: Summary Statistics of Control Variables

Household Characteristics Variable	2001			2003		
	Mean	S.D.	Obs.	Mean	S.D.	Obs.
Household head's age	54.2	13.27	953	55.88	13.19	912
Household head's gender	0.28	0.45	953	0.29	0.46	912
Household members	4.55	1.84	956	4.34	1.74	912
Net income	98,276.24	175,918.20	956	121,960.90	190,641.40	905
Outstanding debt	67,033.35	150,815.60	956	83,905.70	164,068	920
Debt-Income ratio	0.61	1.15	956	0.65	1.15	912
Cultivated land (rai)	23.88	51.21	956	22.83	29.64	912
No. of businesses	0.61	0.88	956	0.76	0.93	912
Household Characteristics Dummy	Fraction	S.D.	Obs.	Fraction	S.D.	Obs.
NE	0.5	0.5	956	0.5	0.5	920
HH members living away	2.35	2.38	956	2.54	2.42	912

5.2.3 Participation and Eligibility Dummies

Program participation, the treatment variable of this study, is a dummy variable whose value equals 1 if the household belongs to the DMP, and 0 otherwise. As discussed in Chapter 3, participation in the DMP is divided between the debt moratorium scheme (MS) and the debt relief scheme (RS). This thesis, however, will consider the effect of the DMP as the collective effect of these two schemes. The reason for not making the distinction between the two schemes is the lack of good and separate instrumental variable for each one. But since the MS and the RS aim to affect the outcome variables in similar ways, considering their collective effects should not result in any biases. What is lost in this failure to distinguish between the MS and the RS is the possibility of comparing impacts across the two schemes.

Program eligibility is another dummy variable of interest. This variable was constructed, following the DMP eligibility criteria described in Chapter 3. Recall that according to these criteria, DMP-eligible households were those that were members of the BAAC in 2001, and whose outstanding loans owed to the BAAC did not exceed Baht 100,000. Eligibility takes the value 1 for households that met these criteria, and 0 otherwise. Table 5.3 summarizes the participation.

Table 5.3: DM-eligible and DM-participation

DMP-eligible	DMP participation		
	Yes	No	Total
Yes	136	193	329
No	0	591	591
Total	136	784	920

Eligible households make up 35.76 percent of the total sample, and the rate of DMP participation among eligible households is 41.34 percent. Five households in our sample reported having exited the DMP between 2001 and 2003. But because these households have benefited from the program, and because they continued to have access to the occupation restructuring programs (as discussed in Chapter 3),

the five households were considered in this study as DMP households.

5.3   Discrepancies in Data

Statistics on the number of Thai rural households that take part in the DMP differ across sources. In his address at the Annual Meeting of the Asian Development Bank in May 2001, when the DMP was just beginning, the governor of the Bank of Thailand stated that preliminary feedback on the DMP from government officials' field interactions with farmers indicated that "around 50 percent of eligible farmers have shown an interest to avail themselves of this debt relief" (Sonakul, 2001).

A report made by the Asian Development Bank on the BAAC later in the same year alluded to the DMP and its participation rate. According to this report, of the "2.37 million eligible farmers, 2.25 million (95 percent), joined the DMP," and in response to the incentives given to the RS, "49 percent of eligible farmers chose [the RS option]" (Asian Development Bank, 2001, 3-4). Furthermore, the document stated that the DMP covered half the BAAC clients, or one third of the bank's loan portfolio (Asian Development Bank, 2001, 3). The source of these statistics was absent, since the report was on the BAAC, these figures presumably came from the bank itself. However, the BAAC progress report on the DMP in 2003 claimed that DMP participants make up 80 percent of their loan portfolio, and that the DMP was able to incorporate 99.99 percent of eligible farmers (BAAC, 2003, 6).

The figures given by the Asian Development Bank and the BAAC seem to indicate that most eligible farmers chose to participate in the DMP. As shown in the previous section, the Townsend Thai data show a figure more consistent with the speech by the governor of the Bank of Thailand made at the time the DMP was beginning to be implemented. In our sample of 920 households, 329 or 35.68 percent, were eligible to apply for the DMP. Of the eligible households, 136 or 41.34 percent reported

participating in the DMP.

This study will rely on the Townsend Thai data for analyses of the DMP and its effects on the Thai rural households for the reasons following. Nothing is known about the methods the BAAC and the Asian Development Bank obtained the statistics on DMP participation. The likelihood of non-randomness in sample selection is greater in statistics of the BAAC because data collection was done with the intention of identifying DMP participants. The collection of the Townsend Thai data began in 1997, several years before the DMP came about. The purpose of the data collection was not to study the DMP, but rather to understand the characteristics of the Thai rural households in general. On these two grounds, the collection methodology of the Townsend Thai data was set *ex ante*, unlikely to be biased toward areas with more DMP participants, and thus more representative of the overall Thai rural households.

Chapter 6

Methodology

One approach to evaluating the impact of the DMP on its participants is to estimate how levels of consumption, asset holdings, or savings differ between participants and non-participants in a cross-sectional data set. However, this nave estimation fails to take into account the biases that arise due to underlying heterogeneities in households' welfare levels and households' self-selection into the program. This thesis attempts to correct for these possible biases by: (1) investigating the changes in households' welfare to difference out the heterogeneities in the outcome variables, and (2) using the instrumental variable approach to correct for self-selection biases.

The following paragraphs discuss the sources of bias in our data, the attempt to address them, and the final econometric specifications for the two-stage least squares approach to evaluating of the effects of the DMP.

6.1 Biases and Resolutions

6.1.1 Omitted Variable Bias

This section discusses the presence of household-level fixed effects.

Household-level fixed effects

In general, character variations among households exist due to fundamental unobservable differences. While observed differences can be included into the regression equation as control variables, unobserved household fixed effects is harder to account for. Because these unobserved heterogeneities may be the cause of underlying welfare disparities among households, it impossible to attribute the difference in welfare levels between two households to any particular occurrence. In other words, that dissimilarity in levels may be purely driven by the underlying difference between those two households.

The problem of omitted variables is illustrated by the model

$$Y_i = \eta D_i + A_i + \epsilon_i, \tag{6.1}$$

where Y_i is the consumption of household i; D_i is a dummy variable which equals 1 if household i belongs to the DMP; A_i represents a fixed and unobservable characteristic of household i that affects its consumption; and ϵ_i is the error term. Because A_i is not observed, its effect on Y_i contributes to the error, which results in a composite error $(A_i + \epsilon_i)$, which we denote by ν_i.

Consumption Y_i of the DMP participant is then predicted by the equation

$$Y_i^{D_i=1} = \eta + \nu_i^{D_i=1}, \tag{6.2}$$

whereas that of the non-participant is given by

$$Y_i^{D_i=0} = \nu_i^{D_i=0}. \tag{6.3}$$

The difference in consumption levels between the DMP participant and non-participant, therefore, is $\eta + (\nu_i^{D_i=1} - \nu_i^{D_i=0})$. This shows that variations in the outcome variable

are motivated by the effect of DMP participation, η, as well as the heterogeneities in A_i underlying the error term. Comparing different consumption levels of the participant and the non-participant therefore does not tell us the *true* effect of the DMP, but rather the effect of the DMP and the unobserved A_i combined.

More importantly, leaving A_i unaccounted for in the error term violates the Gauss-Markov assumption that the expected value of the equation's error term equals zero, given any value of the explanatory variable x_n:

$$E(\nu_i|x_1, x_2, x_3, \ldots, x_n) = 0. \tag{6.4}$$

This violation leads to inconsistent estimation under the ordinary least squares (OLS) methodology. Thus the presence of the unobserved household fixed effects can render estimates of the DMP impact biased.

Eliminating household-level fixed effects

The model outlined above shows how failing to take into account unobserved heterogeneities among households can cause bias in the estimation. Kaboski and Townsend (2002) suggest that a way to eliminate these heterogeneities is to examine the changes in the outcome variables over time, effectively differencing out the fixed effects within each household.

Panel data are particularly suitable for the analysis this kind. The panel data used in this thesis, for example, provide information on a household at two points in time - 2001 and 2003 - and thus allowing the possibility of analyzing the household's change over the two years. Consider again the simple model from above, but with the added time dimension,

$$Y_{i,t} = \eta D_{i,t} + A_i + \epsilon_{i,t} \tag{6.5}$$

where $Y_{i,t}$ is the consumption of household i at time t; $D_{i,t}$ is the dummy variable for the DMP participation of household i at time t; A_i is the unobserved heterogeneity that is time-invariant; and $\epsilon_{i,t}$ is the error term corresponding to the consumption of household i at time t. The two periods of time considered are $t = 2001$ and $t = 2003$.

Taking the first difference of the outcome variable of household i over the two time periods gives:

$$Y_{i,2003} - Y_{i,2001} = \eta(D_{i,2003} - D_{i,2001}) + (A_i - A_i) + (\epsilon_{i,2003} - \epsilon_{i,2001}). \qquad (6.6)$$

Since we allow the 2001 data to approximate the time before the DMP was implemented, $D_{i,2001} = 0$ for all households, because the DMP did not then exist. And Equation 6.6 becomes:

$$\Delta Y_i = \eta D_{i,2003} + \Delta \epsilon_i. \qquad (6.7)$$

Hence investigating the changes in the outcome variable eliminates the hidden fixed effects within the data, and allows a consistent estimate of the impact of the DMP on the participant's consumption growth.

To resolve the similar issue of unobserved household heterogeneities in this study therefore, this thesis investigates the changes, rather than the levels, in outcome variables over the two years. In other words, we investigate the effects of DMP participation on the household's *growth* in consumption, the *accumulation* of assets, and the *growth* in savings, as proposed above.

6.1.2 Endogeneity

Selection Bias

As discussed in Chapter 2, an important issue in the impact assessment study of a program, in which participation is voluntary and self-selected, is how to address the bias arising from the non-randomness that exist between participants and non-participants. When a program attracts households with certain unobserved attributes, the different outcomes as experienced by participants and non-participants are likely to be the combined effect of those attributes and the program, rather than of the program alone. The hidden attributes thus make the effects of a program appear larger or smaller than they actually are.

Because eligible households join the DMP on a voluntary basis, selection bias is also a problem in this study. For example, households with high propensities to consume may choose to apply for the debt moratorium in order to use the money, originally set aside for repayment, for consumption. In this case, the effect of the DMP on household consumption growth will be biased upward.

Recall Equation 6.5:

$$Y_{i,t} = \eta D_{i,t} + A_i + \epsilon_{i,t}. \tag{6.8}$$

In this equation, we assumed A_i to be time-invariant, and thus the term disappears when we take the first difference of $Y_{i,t}$. Consider now an unobserved household characteristic $B_{i,t}$, which is triggered in certain households by the implementation of the DMP. The triggered $B_{i,t}$ results in those households applying for the DMP. An example of this is a household's high propensity to consume limited by income. Prior to knowing about the DMP, this preference was suppressed due to income constraints. The DMP thus served as a trigger of this characteristic. In other words, before any household knew of the DMP, $B_{i,t} = 0$ for all households; and when the program

was announced, this value changed to 1 for this particular household, motivating it to apply to the DMP. In this case, the unobserved household characteristic is not time-invariant, and thus does not disappear in the first-differencing method:

$$Y_{i,2003} - Y_{i,2001} = \eta(D_{i,2003} - D_{i,2001}) + (B_{i,2003} - B_{i,2001}) + (\epsilon_{i,2003} - \epsilon_{i,2003}) \quad (6.9)$$

As before, $D_{i,2001} = 0$. In addition, $B_{i,2001} = 0$. Equation 6.8 now becomes:

$$\Delta Y_i = \eta D_{i,2003} + B_{i,2003} + \Delta\epsilon_i. \quad (6.10)$$

Since the hidden characteristic $B_{i,2003}$ motivated the household to self-select into the DMP, this indicates that $\text{Cov}(D_{i,t}, B_{i,t}) \neq 0$. Because $B_{i,t}$ is not observed, it is left in the error term, which causes the explanatory variable and the error term to be correlated, i.e., $\text{Cov}(D_{i,2003}, \Delta\epsilon_i) \neq 0$. This creates the problem of endogeneity, which violates the Gauss-Markov assumption as discussed in Equation 6.4, leading to biased estimates of the explanatory coefficients.

To address the problem of endogeneity arising from self-selection in the sample of this study, program eligibility is used as an instrumental variable for program participation.

Instrumental Variable

A variable, Z_i, is valid instrumental variable for a general x_i so long as $\text{Cov}(x_i, Z_i) \neq 0$, but $\text{Cov}(\epsilon_i, Z_i) = 0$. Since eligibility was set exogenously by the government, it should make for a valid instrumental variable. An issue that would undermine the validity of this instrument is if eligible households systematically differ from ineligible households in such a way that affects their consumption growth, asset accumulation, or savings growth between 2001 and 2003. Because eligibility was determined by BAAC membership and loan size, it is possible that households that qualified under these criteria

are fundamentally different from those that did not. But because the government announced the eligibility criteria only shortly before the application process for the DMP began, there was not enough time for households to alter their characteristics in order to be eligible for the program. It is reasonable, therefore, to assume that eligibility at the start of the program was exogenous, and not a result of households' alterations of their characteristics, which would make eligibility endogenous.

6.2   Econometric Specifications

The previous section proposes the ways to overcome possible biases in this study arising from household-level fixed effects and self-selection. These proposals are investigating the change in outcome variables, and using program eligibility as the instrumental variable for program participation. This section combines these proposals to identify the econometric equations to be used for the analysis.

This study employs the two-stage least squares approach to estimate the effect of the DMP on its participants. Consider $[\Delta X_{i1} \Delta X_{i2} \ldots \Delta X_{i10}]$, the vector of changes in the 10 control variables over the time period 2001-2003 for each household i. Similarly, denote the 2003 levels of the control variable simply by X_{ik}. The regression equations then take the form

$$\Delta Y_i = \alpha + \beta P_i + \sum_{j=1}^{10} \rho_j \Delta X_{ij} + \sum_J \tau_{iJ} X_{iJ} + \epsilon_i \qquad (6.11)$$

$$P_i = \gamma + \delta E_i + \sum_{j=1}^{10} \lambda_j \Delta X_{ij} + \sum_J \omega_J X_{iJ} + \mu_i. \qquad (6.12)$$

where J is some subset of $\{1, \ldots, 10\}$. ΔY_i is the change in outcome variables – consumption growth, asset accumulation, or savings growth – of household i over

the 2001-2003 time period. P_i is the dummy variable for participation in the DMP, and E_i is the dummy variable for eligibility. ϵ_i and μ_i are the error terms. The sum $\sum_{j=1}^{10} \rho_j \Delta X_{ij}$ controls for the changes in the households over the two-year time period that affects ΔY_i. The sum over 2003 characteristics, $\sum_J \tau_{iJ} X_{iJ}$ controls for household characteristics in 2003 that affect ΔY_i.

In Equation 6.11 and Equation 6.12, we assume that $\text{Cov}(X_i, \epsilon_i) = \text{Cov}(X_i, \mu_i) = 0$. In Equation 6.11, however, households' self-selection into the DMP means that $\text{Cov}(P_i, \epsilon_i) \neq 0$, making β an inconsistent estimate of the effect of participation, P_i. The correlation between P_i and ϵ_i means that the error terms in the two equations are also correlated, i.e., $\text{Cov}(\mu_i, \epsilon_i) \neq 0$. So long as $\text{Cov}(E_i, \mu_i) = 0$, eligibility E_i remains a valid instrument for P_i. For reasons already addressed about using eligibility as the instrumental variable, it is believed that $\text{Cov}(E_i, \mu_i) \approx 0$ in Equation 6.12, making eligibility a reasonable instrument for program participation.

Chapter 7

Results and Discussion

This section provides the main findings of this study. The null hypotheses are rejected at the 5-percent significance, unless otherwise stated. The first-stage F-statistics in all the two-stage least squares (2SLS) regressions range from 22.1 to 32.51. This range indicates that program eligibility is an acceptable instrument for program participation, but ordinary least squares (OLS) estimates may do comparably well in reducing sample biases (Staiger and Stock, 1997). Indeed OLS estimates give results that are consistent in both signs and statistical significance with the 2SLS estimates. This thesis, however, maintains the use of the 2SLS approach, and the results discussed here are those obtained from 2SLS regressions. Tables of regression results are presented in Appendix B.

7.1 Total Consumption Growth

Table B.1 in Appendix B shows the regression results for total consumption growth.

Although regression results on households' consumption growths consistently estimate the coefficient on the DMP to be positive, these estimates are not large and have no statistical significance. Moreover, the estimate of the intercept has no significance, which obscures information on the mean value of consumption growth over the two years being studied.

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Explanatory variables that significantly explain changes in total consumption include the number of household members, households' location in the Northeast, net income growth, farm assets accumulation, business assets accumulation, and the level of business wealth the household has.

Not surprisingly, growth in a household's net income significantly predicts growth in consumption. Regression estimates show the household's marginal propensity to consume to be about 10 to 12 percent. But more interesting are the ways in which agricultural and business assets accumulation affects consumption growth. Agricultural assets accumulation from 2001 to 2003 increases consumption growth in this time period, while business assets accumulation depresses it. The real-world difference in the two growths, however, is rather negligible-Baht 1,000 of marginal agricultural asset accumulation increases consumption growth by about Baht 150, and Baht 1,000 of marginal business accumulation decreases consumption growth by about Baht 300.

The level of agricultural wealth has no significant effects on consumption growth. Higher levels of business wealth, on the other hand, enhance household consumption growth-Baht 1,000 in marginal business asset holdings increase consumption growth by approximately Baht 190. This tells us that households with more business wealth have seen higher consumption growths from 2001 to 2003 than those with lower levels of business wealth.

Higher levels of a household's total savings also have significant and positive impact on consumption growth. The change in the household's savings however does not impact the change in consumption. This means that households with higher underlying levels of savings have seen higher consumption growths in the past two years. This finding is not surprising considering that total savings in our data include rice in storage, which can be used directly for consumption. But using BAAC savings in place of total savings also gives similar results, which indicates that households with higher underlying savings with the BAAC have seen higher consumption growths in

the previous years.

The coefficient on households located in the Northeast indicates that households in this region have seen approximately Baht 14,500 higher in consumption growth than their Central counterparts. This effect is significant, but since the estimated intercept term is not significant, it is unclear what the average change in consumption in the Northeast has been. Segmenting the sample by region takes away the significance of most explanatory variables, but gives some interesting insights. Regressions on the Central region households yield no significant explanators. Growth in income is a significant predictor of growth in consumption in the Northeast, but this is not so in the Central region. A reason for this may be that agricultural activities and agri-businesses are more varied in the Central region. There is therefore less conformity in the ways Central households spend their income, and thus the aggregate consequence of income increases is less clear.

7.2 Agricultural Asset Accumulation

Table B.2 in Appendix B gives the summaries of regression results on agricultural asset accumulation.

The estimated effect of the DMP on agricultural asset accumulation is negative across all regressions using different sets of control variables. These estimates are significant at the 15 percent level. These impact coefficients of the DMP on agricultural asset accumulation are the most statistically significant among all the effects of the DMP being investigated. Our results reveal that a household participating in the DMP has seen approximately Baht 15,000 to Baht 17,000 less in its agricultural asset accumulation than its non-DMP counterpart.

The negative relationship between DMP participation and agricultural assets accumulation is rather worrying as it indicates that households under the DMP have

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been investing less in their farm improvements than those households not under the DMP. It turns out that outstanding loans and the change in the household's debt-income ratio are significant estimators of agricultural asset accumulation. With every extra Baht 10,000 in outstanding loans, agricultural assets accumulation over the past two years increases by Baht 400. As for the debt-income ratio, an incremental increase of 0.1 in this ratio since 2001 enhances agricultural asset accumulation by approximately Baht 12,000.

The fact that loans and increases in loans positively affect agricultural asset accumulation, and that increases in households' income have no apparent impact on this accumulation suggests that the acquisitions of new agricultural assets necessitate borrowings. If this is true, then the negative impact of DMP participation on participants' agricultural asset accumulation, as discovered, may be explained by the credit constraint that DMP households face due to the program's restrictions on funds. To recall from Chapter 3, households that joined the DMP under the debt moratorium scheme (MS) are suspended from taking out new loans until after they exit the program. While households under the debt relief scheme (RS) are not subject to similar constraints, most of the DMP households in our sample joined the program under the MS.

The negative relationship between DMP participation and the household's agricultural asset accumulation is suggestive that this program, designed to ease farmers' credit constraint, may have had the contrary effect on its participants. It must be re-emphasized of course, that this negative relationship is significant only at the 15 percent level. Nonetheless, these findings imply that a debt moratorium conditional on limited access to funds may be less effective in relieving farmers' financial constraints than the absence of such a program.

Another interesting finding is the negative impact of households' savings on agricultural asset accumulation. This effect is true only to households' savings with the

BAAC, however. Total savings, which include other savings accounts, rice in storage, gold, jewelry, and cash kept at home, have no significant effect. The results show that households with higher levels of savings in their BAAC accounts have seen slower accumulations in their agricultural assets. Changes in the households' BAAC savings over the two years, however, do not affect this accumulation in any significant way. This suggests that households with higher underlying savings invest less in agricultural asset accumulation. This fact is consistent with findings on households' business asset accumulations, which will be discussed below.

7.3 Business Asset Accumulation

The results of these regressions on households' business asset accumulation are presented in Table B.3 in Appendix B.

The effect of the DMP on business asset accumulation is negative, but not statistically significant. In these regressions, increases in a household's borrowings over the last two years have repressed increases in business asset accumulation. This result is divergent from the earlier finding of positive correlation between borrowings and agricultural asset accumulation. Furthermore, it turns out that decreases in a household's total savings significantly predict higher business asset accumulation - every Baht 1,000 decrease in total savings increases business asset accumulation by Baht 370 - Baht 480. This implies that households use savings rather than new borrowings to finance acquisitions of new business assets.

These results may indicate a basic difference in the natures of agricultural and business investments, or rather a basic difference between agricultural and business-owning households. Households that own businesses are generally wealthier than households that engage only in agricultural activities, and thus the former households are more likely to have ready access to saved-up funds. These households therefore

can afford to draw on their savings in order to make new investments. Agricultural households, on the other hand, are likely to be more credit constrained, and thus would draw on institutional funds rather than their own when making new investments.

This conjecture is confirmed by our regression results. Indeed households with higher levels of net income are the ones that have seen higher business asset accumulation. Every marginal Baht 1,000 in household income increases business asset accumulation by Baht 264. Interestingly, when the income variable is replaced with the income growth variable, the results did not change. This implies that wealthier households are also those with the higher income growths-and indication of income divergence in the rural areas. Including both income level and income growth into the regression, however, takes away the significance of the income growth variable but leaves the effect of income unchanged.

The relationship between a household's savings and its business investments found in this section helps explain the previous findings, in Part B. The results in Part B show that households with high levels of savings appear to invest less in agricultural assets. The results of this part reveals that this phenomenon may be due to the fact that households with high levels of savings are those that invest in business, rather than in agriculture.

7.4   Growth in BAAC Savings

Table B.4 in Appendix B gives the summary of findings for the effect of the DMP on households' BAAC savings.

The findings on the impact of the DMP on households' savings with the BAAC are, as predicted, not at all significant. In general, it seems there is no good predictor of changes in a household's BAAC savings. In fact, none of the household control

variables are significant in explaining changes in the BAAC savings at all. The most significant explanatory variable on growth in BAAC savings is the household's total business wealth. As discussed earlier, this correlation is due to the fact that house- holds with high levels of business assets are those with higher levels of savings to begin with, and these households are also the ones that have seen higher increases in their net income over the past two years.

The only other significant predictor, albeit only at the 10 percent level, is the change in households' outstanding loans. Decreases in outstanding loans marginally increase the amount of savings a household has with the BAAC.

Chapter 8

Conclusion

This thesis evaluates Thailand's Debt Moratorium Program by investigating the program's attainment of its objectives. The program came about primarily in response to the increased financial pressure on the already declining agricultural sector since the country's economic collapse of 1997. The DMP was proposed in order to temporarily relieve farmers' credit constraints and to provide a transition period for the agricultural sector for longer-term changes. For this reason, accompanying savings incentives and supporting occupation rehabilitation programs were put in place ensure that farmers did not squander their increased disposable income, and to encourage their savings and investments in the restructuring of their operations.

Findings from this study show that the DMP has not achieved these goals in any significant way. There is little evidence of impact on DMP households' consumption growth or savings growth. Moreover, a negative correlation between program participation and households' agricultural investments indicates that some conditions imposed by the program may have been detrimental to its own success. One rule of the DMP stipulates that households under the debt moratorium scheme (MS) are disallowed from taking out more loans from the BAAC until they have successfully repaid the loan under the moratorium. So while the goal of the DMP is to relieve its participants' credit constraints, its own stipulations create new constraints that may perverse the program's intended effects. This study has found that agricultural

households use new borrowings to finance their asset growths. Households under the DMP faced with loan restrictions, therefore, are unlikely to make new agricultural investments during the period of the moratorium due to lack of new funds. Indeed the findings of this study show that agricultural asset accumulation among DMP participants, over the past two years, has been Baht 16,000 lower than that among non-participants-a result contrary to the DMP's aim of encouraging farmer's long-run investments. These findings suggest the importance of financial access to smallholders, and thus indicate financial access is more important than financial relief.

Secondary findings of this thesis reveal significant inequality among rural households. The line of division seems to fall between households involved exclusively in agriculture and those involved in agriculture and agri-businesses. The former households on average have lower levels of savings and higher credit constraints. As mentioned in the previous paragraphs, agricultural households rely on institutional funds for new investments. Agri-business households, on the other hand, are those with higher income levels; these households on average finance new investments with their own savings. Furthermore, regression results indicate a correlation between income levels and income growths, which suggests that inequality between these two types of households maybe growing over time.

Another secondary finding of interest is the correlation between a household's savings growth and its wealth level. This affirms the pattern of inequality discussed in the previous paragraph. It also suggests that savings are a luxury good, for which the demand did not change among poorer households, even in the presence of income and substitution effects in favor of higher savings.

The findings highlighted here indicate that the DMP has fallen short of its objectives. These findings impart some policy recommendations. First, credit constraint is a significant problem among poor rural households. Programs that relieve financial constraints without providing financial access will have little impact on the welfare of

these households. Furthermore, programs that place limitations on the poor household's financial access are detrimental to the household's long-term investments. Second, rural households are not homogenous, and as this study has shown, agricultural households and agri-business households have fundamentally different needs. Rural development programs must be able to differentiate between households in order to effectively target their groups of interest.

Third, before the implementation of any program the characteristics of the target households should be carefully studied before eligibility criteria are laid out. In the case of the DMP, little information is known about how and why the government chose the Baht 100,000 as the eligibility cut-off. The lack of sophistication of the DMP eligibility criteria meant that the households that have been incorporated into the program, as shown from this study, were not necessarily those in the direst needs of debt relief. Fourth, rural households do not respond to savings incentives that are not compatible with their needs. This study has shown that in spite of economic rationale for increased savings among DMP households, the program has been unsuccessful in generating higher savings among rural households. Because rural agents operate under maximization conditions constrained by various factors, an incentive structure that the government deems effective may fail to appeal to the rural households. In order to design savings schemes for rural households, a direct inquiry about the savings needs of these households' needs may be the best method of identifying an effective scheme.

In evaluating the effectiveness of the DMP, this study has taken careful measures to account for possible biases and uncertainties. However, due to limitations of the data, the methodology employed, and the narrow scope of the study, this thesis may be critiqued on the following grounds. First, while this study attempted to account for household-level biases, it did not take into account village-level biases that may be present in the data. Differencing variables for their changes may have reduced the

village-level fixed effects that are embedded in the household characteristics. However, this methodology fails to control for time-variant village effects that may have affected the outcome of the DMP. Second, many of the control variables used in the regression equations are co-determined with the outcome variables. Interpretations of the findings in this study, therefore, have relied on correlations rather than on evidence of causation, rendering conclusions less powerful. Third, this study did not investigate the effects of the DMP on households segmented by income status. An investigation of this kind may reveal different results from those found in this study, and may provide important policy implications if differences in program impact are found among households of different socioeconomic statuses. However, due to the limited pool of DMP households within our sample – 14.72 percent of total – a study that segments the DMP pool is unlikely to provide conclusive results. Lastly, due to its narrow scope and lack of data, this study fails to address an important query about the DMP – its possible effects on the long-run stability of the rural financial market.

While this thesis aspires to shed more light on Thailand's Debt Moratorium Program and to give insights on the effectiveness of government interventions in the rural financial sector in general, it has left many questions still unanswered. As the DMP approaches its end, there are still uncertainties about who have benefited from it, and what its effects on the rural financial systems have been. These questions call for further research and evaluations, which should be of interest to policymakers in the fields relating to rural development. An investigation into other underserved markets within the rural may also reveal important roles of the government. One worthwhile study is the rural insurance market, which remains marginalized in spite of the tremendous need and potential for impact.

As is to be expected, a study of this kind necessitates further studies to answer the questions it has raised. The author of this thesis hopes that her findings contribute

to the knowledge about the roles and limitations of the government, and that her work will spawn other similar academic contributions to the existing body of works in related fields.

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Appendix A

Reference Tables

Table A.1: BAAC Loan Interest Rates – Individual Farmers

Borrower Classification	Symbol	Borrowing Record	Interest Rates (Percent per Annum)
Excellent	AAA	Excellent record of debt repayment with no overdue debt of 3 consecutive years.	MLR 8.00%
Very good	AA	Very good record of debt repayment with no overdue debt of 2 consecutive years.	MLR + 1.00 9.00%
Good	A	Good record of debt repayment with no overdue debt of 1 consecutive years.	MLR + 2.00 10.00%
General	B	Newly registered borrower or originally indebted one but all overdue debts have been clear.	MLR + 3.00 11.00%
Breach of contract, type 1	-	Borrower with overdue debt stemmed from unintentionally unavoidable cause but the postponement of debt repayment has been approved.	MLR + 3.00 + 1.00 12.00%
Breach of contract, type 2	-	Borrower with overdue debt but having no reason based for postponement of the debt repayment.	MLR + 3.00 + 3.00 14.00%
		Source: http://www.baac.in.th/ eng_baac/interest/loanrate.htm (updated December 1, 2002), cited February 25, 2004.	

Table A.2: BAAC Loan Interest Rates – Farmer Institutions

Borrower Classification	Loan Interest Rate (Percent per Annum)
First class	MLR - 1.00 -1.00 5.50%
Second class	MLR - 1.00 - 0.50 6.00%
Third class	MLR - 1.00 6.50%
New borrowing farmer institution	MLR - 0.50 7.00%
Farmer institution with any unusual cause	MLR 7.50%
Farmer institution with unusual cause (type 1)	MLR + 1.00 8.50%
Farmer institution with unusual cause (type 2)	MLR + 3.00 10.50%
Source: http://www.baac.in.th/eng_baac/interest/ loanrate.htm (updated December 1, 2002), cited February 25, 2004.	

Table A.3: *Changwat*-specific weights for household consumption

Items	All	Central	Northeast	Lopburi	Chachoengsao	Buriram	Sisaket
Grain	0.8375101	0.1987949	1.175502	0.7652483	0.9330868	1.118146	1.371775
Milk	2.021826	2.242479	1.329666	1.964817	2.54005	1.396341	1.266376
Meat	2.109125	2.206781	2.044578	0.3249673	4.103692	2.015372	1.952975
Alcoholic beverage at home	1.020318	0.6032538	1.222347	0.2913007	1.339199	1.350232	1.01216
Alcoholic beverage away from home	1.398065	2.081461	0.9165651	-1.366178	2.857633	0.2572856	1.139385
Tobacco	2.655077	2.837919	0.7664294	3.920852	2.120593	2.104222	0.0129629
Fuel	4.762907	6.962342	2.416823	9.507549	3.5176	2.381442	2.543302
Ceremony	0.9687892	0.8805438	1.050037	1.058515	0.8728654	1.190826	0.9933028
Spending on shelter	1.075161	0.8880207	1.070698	0.6197217	1.027337	1.064548	1.131493
Vehicle operation	1.243934	1.179588	1.65072	1.305121	1.223589	1.439651	1.724145
Education expense	0.3377798	-0.7023994	1.611033	0.2292638	-1.298091	1.525743	1.629429
Clothes	1.346175	1.176849	1.330923	1.970142	0.1759762	1.256688	1.596709
Meal away from home	1.834263	1.994921	1.242029	1.238635	2.428471	1.633718	0.9840472
Constant	206.5691	175.6849	613.0359	194.8129	-61.78402	550.3632	525.7095

Table A.4: Summary Statistics of Household Data

	2001			2003		
	Mean	S.D.	Obs.	Mean	S.D.	Obs.
Outcome Variables						
Total yearly consumption	73,429.91	85,468.24	956	78,368.31	101,145.90	917
Gross depreciated assets	1,419,435	2,586,122	793	1,452,824	4,161,342	779
-Agricultural	27,699.50	69,254.64	793	31,671.36	103,913.60	779
-Business	14,315.24	69,037.99	793	22,553.32	197,393.50	779
-Household	71,409.42	126,043.30	793	88,474.89	185,682.20	779
BAAC savings	3,433.60	23,115.71	956	3,584.55	17,610.24	920
Household Characteristics Variables						
Household head's age	54.20	13.27	953	55.88	13.19	912
Household head's gender	0.28	0.45	953	0.29	0.46	912
Household members	4.55	1.84	956	4.34	1.74	912
Net income	98,276.24	175,918.2	956	121,960.9	190,641.4	905
Outstanding debt	67,033.35	150,815.6	956	83,905.7	164,068	920
Debt-Income ratio	0.61	1.15	956	0.65	1.15	912
Cultivated land (rai)	23.88	51.21	956	22.83	29.64	912
No. of businesses	0.61	0.88	956	0.76	0.93	912
Dummy Variables						
NE	0.50	0.50	956	0.50	0.50	920
HH members living away	2.35	2.38	956	2.54	2.42	912
DMP participant	0.15	0.35	922	0.15	0.36	920
DMP eligible	0.37	0.48	956	0.36	0.48	921

Appendix B

Regression Results

Table B.1: Consumption Growth

	-1	-2	-3
DMP	3,897.18	5,353.15	9,544.72
	[15,575.565]	[15,532.253]	[15,535.692]
No. Household members	4,991.705***	4,229.929**	3,900.394**
	[1,780.782]	[1,790.233]	[1,781.892]
Age of head	-185.321	-138.744	-233.953
	[323.223]	[321.916]	[321.071]
Female head	-2,165.12	-2,249.27	-2,537.63
	[6,915.355]	[6,886.015]	[6,842.299]
Amount of land cultivated (rai)	-62.558	-122.033	-150.124
	[121.029]	[127.339]	[126.836]
Children living away	-237.206	-262.746	204.548
	[1,763.481]	[1,756.196]	[1,750.880]
Northeast	15,293.817**	15,743.279**	14554.83**
	[7,097.195]	[7,060.343]	[7,026.887]
(Change) Amount outstanding	-0.011	-0.013	-0.026
	[0.037]	[0.038]	[0.037]
Debt-income ratio	-4,229.13	-4,473.79	-4,148.63
	[2,787.294]	[2,913.378]	[2,895.232]
No. Businesses	57.13	-1,084.94	-961.63
	[3,313.293]	[3,397.030]	[3,375.818]
(Change) Net income	0.102***	0.120***	0.117***
	[0.016]	[0.017]	[0.017]
(Change) Total agricultural asset	0.146***	0.164**	0.165**
	[0.050]	[0.066]	[0.066]
(Change) Total busines asset	-0.086***	-0.339***	-0.337***
	[0.021]	[0.083]	[0.082]
Occupation: Shrimp farmer	-61,025.09	-71,295.937*	-69,202.010*
	[41,804.846]	[41,720.832]	[41,459.809]
Occupation: Rice farmer	-12,172.68	-10,269.09	-10,694.07
	[7,401.388]	[7,385.245]	[7,339.608]
Occupation: Professional	6,130.33	7,772.98	-12,169.42
	[16,776.597]	[16,698.882]	[17,626.242]
BAAC savings	0.632***	0.547**	0.347
	[0.229]	[0.230]	[0.237]
Total agricultural asset		-0.004	-0.016
		[0.040]	[0.040]
Total business asset		0.189***	0.188***
		[0.060]	[0.060]
Total savings			0.179***
			[0.054]
Constant	-12,003.92	-12,506.14	-8,347.63
	[18,198.400]	[18,118.749]	[18,040.207]
Observations	765	765	765
R-squared	0.09	0.11	0.12

Standard errors in brackets.
* significant at 10%;
** significant at 5%;
*** significant at 1%

Table B.2: Agricultural Asset Accumulation

	-1	-2	NE	CEN
DMP	-15,136.32	-17,043.04	54.944	-31,583.53
	[11,262.784]	[11,411.904]	[7,506.471]	[24,151.358]
No. Household members	-194.156	-170.508	585.618	157.401
	[1,322.979]	[1,327.139]	[980.709]	[2,479.249]
Age of head	439.942*	425.569*	246.981	317.384
	[240.712]	[240.317]	[182.046]	[435.044]
Female head	6,797.34	7,227.94	-3,437.79	15,659.59
	[5,155.663]	[5,154.517]	[3,798.927]	[9,572.604]
Amount of cultivated land (rai)	711.276***	697.182***	130.065	746.038***
	[80.612]	[81.665]	[95.326]	[115.670]
Children living away	-3,683.335***	-3,460.810***	-2,684.624***	-3,222.74
	[1,313.600]	[1,309.932]	[943.326]	[2,492.727]
Northeast	3,301.38	3,190.62	0	0
	[5,328.688]	[5,266.877]	[0.000]	[0.000]
(Change) Outstanding	-0.005			
	[0.030]			
(Change) Debt-income ratio	13,345.909***	11,906.517***	2,642.95	17,229.692***
	[2,183.160]	[2,006.672]	[1,740.647]	[3,348.777]
(Change) No. Businesses	2,557.18			
	[3,291.019]			
(Change) Net income	-0.006	-0.008	0.005	0.001
	[0.012]	[0.012]	[0.009]	[0.020]
BAAC savings	-0.378**	-0.382**		
	[0.170]	[0.173]		
Occupation: Shrimp farmer	392.636	-980.664		
	[31,477.334]	[31,220.011]		
Occupation: Rice farmer	1,377.87	2,690.10		
	[5,535.824]	[5,532.751]		
Occupation: Professional	-3,956.49	-13,142.31		
	[12,555.081]	[12,950.994]		
Amount outstanding		0.038***	-0.022*	0.063***
		[0.015]	[0.013]	[0.023]
No. Businesses		-3,353.51	-1,539.14	-3,484.60
		[2,477.348]	[1,872.011]	[4,495.189]
(Change) BAAC savings		0.066	0.583	-0.024
		[0.216]	[0.462]	[0.289]
Constant	-21,271.18	-20,846.64	2,082.76	-23,199.91
	[13,483.472]	[13,565.492]	[9,874.113]	[24,556.219]
Observations	768	768	399	369
R-squared	0.16	0.17	0.05	0.22

Standard errors in brackets.
* significant at 10%;
** significant at 5%;
*** significant at 1%

Table B.3: Business Asset Accumulation

	-1	-2	-3	-4
DMP	-38,203.50	-36,933.06	-36,860.55	-25,724.42
	[26,284.109]	[26,120.363]	[26,609.674]	[25,686.091]
No. Household members	-379.714	-613.853	-612.544	-5,494.717*
	[3,047.733]	[3,020.212]	[3,020.898]	[2,992.007]
Age of head	733.07	674.387	674.785	723.075
	[552.636]	[549.414]	[550.264]	[531.440]
Female head	-8,333.30	-6,453.65	-6,477.40	-1,638.59
	[11,772.144]	[11,702.209]	[11,700.163]	[11,316.383]
Amount of cultivated land (rai)	482.706***	458.442**	458.876**	132.886
	[186.402]	[185.240]	[184.354]	[183.547]
Children living away	-3,862.00	-3,557.21	-3,564.57	-2,695.90
	[3,015.632]	[2,999.481]	[3,000.354]	[2,899.837]
Northeast	21,830.177**	20,964.885*	20,970.691*	28,376.193***
	[11,083.193]	[11,067.204]	[11,041.821]	[10,721.265]
Outstanding loans	0.014	0.001		
	[0.035]	[0.035]		
(Change) Outstanding loans	-0.137**	-0.127*	-0.127**	-0.157**
	[0.067]	[0.066]	[0.063]	[0.061]
No. Businesses	8,808.07	11,451.050*	11,463.599*	7,788.77
	[5,691.564]	[6,320.082]	[6,269.395]	[6,079.955]
(Change) Net income	0.171***	0.175***	0.175***	0.015
	[0.026]	[0.026]	[0.026]	[0.034]
BAAC savings	0.729*	0.38	0.379	-0.161
	[0.403]	[0.410]	[0.410]	[0.403]
Total savings	-0.005	0.14	0.14	-0.025
	[0.089]	[0.097] 7 [0.096]	[0.095]	
(Change) No. businesses		-6,611.22	-6,626.93	-382.59
		[8,267.734]	[8,240.305]	[8,007.183]
(Change) BAAC savings		1.553***	1.554***	1.586***
		[0.507]	[0.507]	[0.490]
(Change) Total savings		-0.482***	-0.483***	-0.372***
		[0.140]	[0.140]	[0.136]
Debt-income ratio			-74.591	2,470.74
			[4,595.784]	[4,455.849]
Net income				0.264***
				[0.036]
Constant	-47,195.00	-45,622.16	-45,564.62	-51,890.500*
	[30,994.380]	[30,831.995]	[30,823.263]	[29,775.712]
Observations	768	768	768	768
R-squared	0.08	0.1	0.1	0.17

Standard errors in brackets.
* significant at 10%;
** significant at 5%;
*** significant at 1%

Table B.4: Growth in BAAC Savings

	-1	-2	-3
DMP	-210.289	-178.804	-141.047
	[1,986.434]	[1,986.947]	[1,998.768]
No. Household members	-90.937	-83.489	-85.456
	[233.508]	[233.737]	[235.748]
Age of head	-55.841	-58.596	-58.722
	[41.175]	[41.220]	[41.386]
Female head	224.414	252.941	244.558
	[879.762]	[881.095]	[886.863]
Amount of cultivated land (rai)	14.03	12.666	12.658
	[14.882]	[15.537]	[15.808]
Children living away	279.408	285.099	283.175
	[225.024]	[225.341]	[226.488]
Northeast	-165.422	-197.051	-141.605
	[826.358]	[826.155]	[910.095]
Debt-income ratio	447.541	416.687	418.758
	[357.187]	[376.183]	[378.836]
(Change) Outstanding loans	-0.009*	-0.009*	-0.009*
	[0.005]	[0.005]	[0.005]
No. Businesses	-200.756	-181.323	-181.227
	[423.910]	[437.194]	[438.090]
Net income	0	0.002	0.002
	[0.003]	[0.003]	[0.003]
(Change) Net income	-0.001	-0.003	-0.003
	[0.002]	[0.003]	[0.003]
(Change) Total agricultural assets	-0.005	-0.009	-0.009
	[0.006]	[0.008]	[0.009]
(Change) Total business assets	0.008***	0.023**	0.023**
	[0.003]	[0.011]	[0.011]
Total agricultural assets		0.003	0.003
		[0.005]	[0.005]
Total business assets		-0.012	-0.012
		[0.008]	[0.009]
Occupation: Rice Farmer			-103.646
			[951.063]
Occupation: Shrimp Farmer			1,174.78
			[5,398.056]
Occupation: Professional			-194.377
			[2,251.872]
Constant	2,768.70	2,779.39	2,794.64
	[2,313.075]	[2,315.023]	[2,334.015]
Observations	768	768	768
R-squared	0.02	0.02	0.02

Standard errors in brackets.
* significant at 10%;
** significant at 5%;
*** significant at 1%