Households as Corporate Firms

An Analysis of Household Finance Using Integrated Household
Surveys and Corporate Financial Accounting

Krislert Samphantharak,
Robert M. Townsend

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This investigation proposes a conceptual framework for measurement necessary for an analysis of household finance and economic development. The authors build on and, where appropriate, modify corporate financial accounts to create balance sheets, income statements, and statements of cash flow for households in developing countries, using integrated household surveys. The authors also illustrate how to apply the accounts to an analysis of household finance that includes productivity of household enterprises, capital structure, liquidity, financing, and portfolio management. The conceptualization of this analysis has important implications for measurement, questionnaire design, the modeling of household decisions, and the analysis of panel data.

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An Analysis of Household Finance Using
Integrated Household Surveys and Corporate
Financial Accounting

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To Khun Sombat Sakuntasathien and
the staff at the Thai Family Research Project

"When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science."

Lord Kelvin, 1891–4

"The only way to obtain measures [of income and consumption] is by imposing an accounting framework on the data, and painstakingly constructing estimates from myriad responses to questions about the specific components that contribute to the total."

Angus Deaton, 1997

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Preface

This monograph emerged from our efforts to study the behavior of the households from the Townsend Thai Monthly Survey. This experience convinced us that imposing an accounting framework and creating financial statements would be a useful, indeed a necessary, first step for the analysis of household finance, especially from high-frequency, monthly data. We believe that this accounting framework will help researchers better define and more accurately measure household income, consumption, saving, and other financial variables, and in the end enhance our understanding of the behavior of the households in developing countries. As we illustrate in this monograph, the corporate accounting framework also allows us to apply the concepts of corporate financial analysis and theories in corporate finance to the study of household behavior. It is important to emphasize that although some specific, arbitrary decisions have to be made when we work with survey data such as those from the Townsend Thai Monthly Survey in this monograph, the accounting framework in general is not specific to any survey. The accounting framework could be largely applied to other household surveys in developing countries.

The work on this monograph began when both of us were at the University of Chicago. The early idea benefited from our conversation with former students in the Townsend research group, especially Masayuki Tachiiri. Subsequently, Nick Bloom, Angus Deaton, Takeo Hoshi, Costas Meghir, Jonathan Morduch, Chris Woodruff, the editor (Andrew Chesher), and three anonymous referees have provided detailed comments and suggestions, at various stages of the project.

We have also benefited from the comments from seminar participants at the Massachusetts Institute of Technology (MIT), Princeton University, the University of California at San Diego, the University of Thai Chamber of Commerce in Bangkok, and the Ministry of Finance of Thailand, as well as students at the University of Chicago and MIT. Anan Pawasutipaisit and Archawa Paweenawat were a tremendous part of writing the code to extract data from monthly surveys consistent with the conceptualization of the accounts. Each is now using and further refining the data from these accounts in their papers on household enterprises and trade, respectively. Hiroyuki Yamada helped impute the returns on household labor, allowing us to adjust our measures of return on household assets and wealth. Parts of this monograph were previously circulated as a working paper under the title "Households as Corporate Firms: Constructing Financial Statements from Integrated Household Surveys."

PART I

Households as Corporate Firms

Introduction

In his Presidential Address delivered to the American Finance Association, John Campbell argued for the importance of "household finance," an academic field that has attracted much interest but still lacks definition and attention within the finance profession. Analogous to corporate finance, household finance asks how households use financial instruments to attain their objectives. We argue further that the study of household finance is not only important for households as investors in developed economies; but it is also crucial for households running businesses and farms in developing countries, where financial markets are often problematic and household consumption, investment, and production decisions are likely nonseparable. Understanding the financial environment and financial behavior of these households should ultimately help researchers and policymakers gain a greater understanding of behavior, evaluate existing policies targeting poverty, and potentially help remove distortions in financial markets.

The study of the financial environment and household financial behavior occupies a large share of the growing literature on empirical development economics in the past few decades. Household surveys have been promoted by governments, international organizations, academics, and survey groups in many countries, providing useful data for research into various aspects of household finance. Although studies using data from household surveys have provided several important insights about the financial situation and behavior of households in developing countries, some challenges remain. Most

importantly, definition and measurement of variables used in these surveys and studies are sometimes inconsistent or unclear. This problem is acute for the studies using high frequency data, even though such data are much needed for the analysis of short-term behavior of the households for understanding risks, liquidity management, and how they interact with the longer term performance of household enterprises and wealth accumulation of household units.

This monograph proposes a conceptual framework for measurement that is widely accepted and used in other areas, namely corporate financial accounting and national income accounting. We modify the concepts of corporate financial accounting so that the accounts are more appropriate to the study of household finance in developing countries. We impose this modified accounting framework onto an integrated household survey and construct the three main household financial statements accordingly: the balance sheet, the income statement, and the statement of cash flows. Finally, we illustrate the use of the accounts for the analysis of household finance.

1.1. THE CHALLENGES

As emphasized by Campbell (2006), the study of household finance is particularly challenging because household behavior is difficult to measure and households face constraints not captured by standard finance literature, namely participation and diversification constraints. Households also have important non-traded assets, namely their human capital. They also hold illiquid assets, namely land and houses. Although Campbell's argument is based on studies using data from developed countries, a similar argument applies to households in developing countries. Indeed, the study of household finance in developing countries poses yet even more challenges. Many households in developing countries are not simply consumers supplying factor inputs and purchasing and consuming outputs. They are also engaged in production in both farm and non-farm activities. There are often large timing differences between inputs purchased and outputs sold, as for farmers with infrequent harvests; and timing differences

between inputs acquired and revenue received, as for businesses with inventories and trade credits. Thus high frequency data are important for the study of liquidity, the protection of consumption and investment from cash flow fluctuations, and how the households finance the operation of their business activities. We also wish to know the long-run underlying financial situation of these households. How effectively does the household as a business use its assets in productive activities to generate income? What are the rates of return on assets and credit relative to alternative uses?

These issues necessitate the distinction between cash flow as a measure of liquidity and net income as a measure of performance. While this distinction has been at the heart of financial economics for some time, recent events in the US and global financial markets more than remind us of the difference. For corporate firms, liquidity problems causing failures or capital injections are in principle distinct from poor performance, bankruptcies, and inefficient bailouts. In developing economies these problems are compounded by the fact that many households are also running small business, and their consumption and investment are likely nonseparable. How in practice does one draw the distinction between liquidity and performance, even during normal times?

Definitions of income and cash flow are clear in the corporate finance and accounting literature, but how do we apply them to households running business? On the one hand, most surveys of firms do not consider the situation of the owners. Although consumption of shareholders is less relevant for decision making in large corporations with dispersed shareholders, it is tightly linked to the policies of private, closely-held businesses in which the shareholders are the owners and dividends largely contribute to their consumption. On the other hand, Living Standards Measurement Study (LSMS) surveys, Family Life Surveys, and other household surveys in developing countries do recognize both consumption and production activities. Although these surveys are remarkably detailed and ask many excellent questions, they are often unclear about the concept and measurement of income as well as consumption, investment, and financing: What do we mean by *income*? In other words, is income entered at the time of

production or the time of sale? How do we treat multi-period production? What do we do with input costs that come substantially before the eventual output?

We illustrate with some examples. Although the agricultural module in the World Bank's Living Standards Measurement Study questionnaires asks the households several useful questions, its wording or meaning of questions is sometimes unclear. The survey asks about inputs used over a specified cropping season, and the amount spent, equating the two. But for some households these are not equal.[1] If the households used inputs held in previous inventory, then expenditures during the specified season might be recorded as zero. Likewise, inputs purchased during the season may not have been used on the plot. Revenue raises similar timing issues. The LSMS agricultural module asks about production during the past 12 months or the past cropping seasons, and also about sale of any of that product, but sales from product inventory is typically not asked, or at least not clearly distinguished.[2] Other transactions commonly observed in developing economies are also sometimes nontrivial when it comes to an economic analysis of household behavior: How do we deal with consumption of household production, output which is never sold? How are input and output carry-overs entered in the accounts? Where do we put gifts, transfers, and remittances, which are typically thought of as income while they are not clearly associated with a production activity? Aside from measurement errors that naturally occur during any survey, it is crucial that we define variables in such a way that they are consistent with a logical framework, measure them accordingly, and organize them systematically. Indeed, several studies such as Singh, Squire and Strauss (1986) as well as Deaton (l997) discuss

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[1] The LSMS questionnaire from the Albanian Institute of Statistics (2005) asks "How much […] did you use during the past cropping season?" (Module 12: Agriculture, Part D: Inputs, Questions 2 and 3) and "How much did you spend in total for […] during the last cropping season? (Question 4).

[2] LSMS questionnaire from Reardon and Glewwe (2000) asks "How much of the […] you harvested during the last two cropping seasons was sold?" (Agricultural Module, Standard Version, Part C2: Disposition, Question 3) and "What price did you get for the […] you sold?" (Question 4).

various important issues pertaining to the subject of household models and surveys, especially data requirements and implications for data collection.

1.2. OUR SOLUTION: CONSTRUCTING FINANCIAL STATEMENTS FROM INTEGRATED HOUSEHOLD SURVEYS

We argue in this monograph that there is a need to impose an accounting framework on the survey data. As anticipated in the quote in the introduction from Angus Deaton (1997), individual transactions need to be measured in order to construct the overall variables of interest. However, this procedure is not straightforward. Thus, we apply, and modify where appropriate, the standard corporate financial accounting to household survey data as it was invented to deal with various types of both trivial and nontrivial transactions. Corporate financial accounts are also a foundation of national income and product accounts, allowing researchers to link the study of household finance at the micro level to the aggregate macroeconomy.

Specifically, we create the balance sheet, income statement, and statement of cash flows for households in developing countries. The purpose is to better measure productivity, risk, and the short-run and long-run financial situations in an analysis of high frequency but long duration panel data. Although measurement errors from the survey still remain in the accounts, the accounting framework with bookkeeping and integrated accounts helps one detect errors and think through the multiple places where the errors would enter. For example, unreported cash expenditure on food implies that consumption in the income statement is underreported and cash holding and wealth in the balance sheet are overstated.

What emerges is an analogy between households and corporate firms. For example, household wealth can be viewed as equity, consumption as dividends, gifts as equity issue, and the household budget constraint as the firm cash flow constraint. We distinguish savings as budget surplus in the cash flow statement versus savings as wealth accumulation in the balance sheet. Likewise we distinguish

the liquidity management of the budget deficit from asset and liability management of wealth accumulation.

We use an existing high frequency household survey that contains a series of detailed questions to create the line items of each of the financial statements. We do this by identifying for every single transaction exactly how it enters into the balance sheet, income statement, and statement of cash flows. This procedure had to be done at least initially on a household-by-household and period-by-period basis. There are many nontrivial decisions concerning multi-period production activities, storage, inventories, livestock aging, loan repayments, barter transactions, gifts and transfers, consumption of household-produced outputs, and other intra-household transactions, for example.

More specifically we use data from the Townsend Thai Monthly Survey, a monthly survey covering 16 villages and approximately 700 households in rural and semi-urban areas of Thailand. First, we deliberately selected two distinctive households with both typical and unconventional, challenging transactions. We created the accounts for these households by hand, as we conceptualized the problem and made decisions. Then, with our conceptualization, we automated the procedure for all households in the survey, using computerized codes to create the accounts. Much of this manuscript contains a discussion of the issues and the particular decisions we have made. We place a great priority on clarity and a systematic treatment, though we are open about particularly challenging transactions and alternatives to what we have done. Essentially, for some of the nontrivial transactions, the financial accounting framework forces us to make arbitrary decisions and be clear about them. This is an important contribution of this monograph as otherwise there would be ambiguity in the concepts and measurement. Others may disagree with some of our arbitrary decisions. However, we still encourage them to impose the accounting discipline of bookkeeping onto the survey data, as we argue for its advantages below.

Obviously, creating household financial statements is not the only method that can be used to study financial situations and behavior of the households in developing countries. There are studies on

consumption smoothing, financing of household investment, and productivity of household production activities that do not rely on an accounting framework. We argue however that using corporate financial accounting as a conceptual framework for an analysis of household finance does have several advantages.

First, corporate financial accounts help the researcher better define financial variables. As argued earlier, financial accounting clearly distinguishes between accrued income versus cash flow and savings as wealth accumulation versus savings as budget surplus. It also clarifies the distinction between household assets and household wealth (equity), hence leading to the difference between returns on assets and returns on wealth. Financial accounting also helps researchers systematically categorize many sub-items of the main variables in each account. For example, total assets of a household consist of cash, account receivables, deposits at financial institutions, other lending, inventories, and fixed assets. Liabilities include account payables and other borrowing. Wealth is from cumulative savings and gifts received. Net income is the difference between total revenue and total expense, and is spent on consumption or saved. Financing comes from cash in hand, deposits at financial institutions, rotating savings and credit association (ROSCA) (recalls of) lending, borrowing, and gifts received. Clear definitions of the variables of interest in turn help improve the clarity of the survey questionnaire, especially for delicate issues that arise in the wording of the questions, e.g. the ambiguity in the LSMS agricultural module we discussed earlier. The accounting framework helps us design questionnaires that distinguish between the timing of acquisition, uses, harvests, and sales of inventories.

Second, another advantage of corporate financial accounts is that, by definition, financial statements have to reconcile across accounts. Specifically, we use three accounting identities to confirm that the accounts are constructed correctly: (1) In the balance sheet, household total assets must equal the sum of household total liabilities and household wealth. (2) An increase in household wealth from the balance sheet must equal the sum of gifts received and household savings, where gifts received are from the statement of cash flows, and savings are the difference between accrued net income and household

consumption from the income statement. (3) The net change in cash from the statement of cash flows must equal to the change in cash from the balance sheet. With these balanced accounts, we do not have a problem commonly encountered in other multi-topic surveys, that a variable generated from one set of questionnaire responses yields a different value when computed from an alternative set of responses. For example, Kochar (2000) reports that household savings in the LSMS surveys computed as household income minus consumption is different from household savings computed from change in household assets. Obviously, one of the possible explanations is that the change in household assets could be financed from an increase in household liabilities in addition to household savings. Another is that the cash flow concept could be implicit in the first measure of savings while accrual concept was used in the second. The rigorous accounting framework guarantees that various ways to compute the same variable give us identical result or makes clear that they are not the same variable after all.

Third, financial accounts provide us with a simple way to apply the standard financial accounting analysis to the study of household finance. In fact, we illustrate this financial analysis in chapter 5 with two case study households. We present returns on household assets and wealth, various measures of risk and liquidity, financing mechanisms of consumption and investment, as well as wealth management strategies of these two households. In addition, for economic modeling, financial accounts allow us to apply theories and empirical strategies in the finance literature to the study of parallel issues for households. These theories include capital structure and the financing of fixed investment, dividend payouts, liquidity management, portfolio allocation, performance of assets, and trade-off between risks and expected returns. We present one of these possible applications in chapter 6, analyzing liquidity constraints, kinship networks, and the financing of household investment. We also discuss other possible modeling of households as corporate firms in chapter 7.

Finally, although not explicitly illustrated in this monograph, applying standard corporate financial accounting to households and their business enterprises allows the researcher to have consistent metrics

that can be used to compare and contrast the performance and financial situations of small and medium household enterprises with the performance and financial situations of larger corporations. For example, how representative of the business sector of an economy is the data from large corporate firms? To answer this question, the performance and financial situations must be measured in the same way. Moreover, as we argue in chapter 2, corporate financial accounting defines the measure of accrued income from household enterprises in such a way that the line items can be used to yield the value added from production. This measure is thus consistent with the definition of national income in the National Income and Product Accounts (NIPA). In fact, the private enterprise income account of NIPA is derived precisely from the standard corporate income statements of business enterprises. Therefore, these household financial accounts can be used to estimate the contribution of small household enterprises to GDP and to study the microfoundations of the aggregate macroeconomy more generally.

1.3. WHAT WE LEARN: SOME FINDINGS FROM THE TOWNSEND THAI MONTHLY SURVEY

As mentioned in the previous section, we apply our conceptual framework to the Townsend Thai Monthly Survey to illustrate how we construct financial statements, and how we use the accounts in an analysis of household finance. We demonstrate two different, but complementary, approaches to the analysis of household finance. First, in chapter 5, we conduct a financial analysis of two illustrative case study households: a relatively rich retailer and a relatively poor farmer. Second, we use regression analysis to study liquidity constraints and the financing of household investment in chapter 6. The case study approach is of course the one used by financial analysts and creditors, as one wants to know how well, or how poorly, a given firm or household is doing. The findings from the case study method are likely to be specific and may not be general so we supplement each finding from these two households with the quartiles from their corresponding provinces.

These supplementary statistics not only allow us to make comparative statements of the case study households relative to others in the same region, they also give us important summaries of key statistics in the Townsend Thai data. Regression analysis, on the other hand, provides us with some structure and hypothesis testing of neoclassical benchmarks using the entire sample of households, but of course this approach foregoes the details of the behavior of individual households.

The application of the accounts reveals some interesting findings regarding households as entrepreneurs in a developing economy. Although the detailed discussions are in chapters 5 and 6 of this monograph, we highlight some of the findings here.

First, there is a relatively large dispersion of the average rates of return on assets across households (even after the returns are adjusted for household labor and risks, as discussed below). Relatively poor households seem to have higher rates of return. We can decompose rates of return into a profit margin ratio and an asset turnover ratio, to get a sense of different business strategies, as in industrial organization and microfinance literature.

Second, for some households, the rate of return on assets can be substantially different from the rate of return on wealth (or equity) of the household, especially for households with high levels of debt relative to wealth. For others, the small difference between return on assets and return on wealth would indicate that debt levels are relatively low, likely because either there are credit market imperfections or such households appear unwilling to borrow.

Third, the returns on assets drop dramatically when we subtract off imputed opportunity costs of household labor. The variation in the rates of return remains. Further adjusting for risk premia suggested by the Capital Asset Pricing Model (CAPM) lowers the return of some households relative to their position in the cross-sectional distribution of households in the village if their returns are highly covariate with the village average. Poor households seem to have higher risk-adjusted return than rich households.

Fourth, income volatility is high. Cash flow highly fluctuates, much more so than accrued income. Consumption is smoother, however,

especially for consumption of household-produced outputs. There is some evidence of smoothing, in the sense that correlations of consumption with either measure of cash or accrual income are less than unity and often low.

Fifth, some households appear to base their behavior more on accrued net income than cash flow, in the sense that the correlation of consumption and income is higher for the accrued income than for the cash flow. Consumption of other households is more sensitive to liquidity in the form of cash flow rather than accrued net income. Investment of most households is usually either uncorrelated, or negatively correlated, with accrued net income. Consumption is negatively correlated with investment for some households, indicating that these households may finance their consumption by selling their assets, or finance their investment by reducing their consumption.

Sixth, cash is used to finance consumption and investment–cash flow deficits. However, there are nontrivial fractions of households that use gifts and borrowing, particularly so in the less developed province. Also, there are nontrivial financial transactions that appear not directly or at least not immediately related to cash flow deficits. For example, for the case study households, borrowing is put on deposit as financial savings; borrowing decreases with incoming gifts; and gifts are held as cash.

Seventh, in terms of wealth management, increases in equity of the household are associated with increases in cash in the more developed province, though for the case study households this is due in part to substitutability between cash and other assets in the portfolio. For those households in the poorer province, change in inventories seems to be a nontrivial part of wealth management.

Eighth, investment–cash flow sensitivity analysis suggests that the rural and semi-urban households in our sample seem to face liquidity constraints. The constraints are partially mitigated by local kinship networks, i.e. having immediate relatives living in the same village. The network effect may come in both direct channels (gifts and borrowing from people within village) and indirect channels (signal of quality by being a part of the network).

Finally, our findings show that although investment–cash flow sensitivity implies liquidity constraints, the reverse may not be true. Households with low investment–cash flow sensitivity may be carrying a large stock of cash in order to avoid cash flow constraints. As stock of cash in hand is an internal fund, the result suggests that households may be liquidity constrained even when the cash flow sensitivity is low.

1.4. PLAN OF THE MONOGRAPH

The monograph proceeds as follows. The remainder of part I consists of chapter 2, which provides a conceptual framework of this monograph. In particular, we draw the analogy between a typical household and a typical corporate firm, and discuss some differences between the two. Chapter 2 also presents the conceptualization underlying the standard financial accounting, as the background for our construction of household financial statements.

Part II of the monograph presents the actual construction of household financial statements from household surveys. Chapter 3 starts with a discussion on the features of generic integrated household surveys conducted in developing countries. We also discuss the trade-offs regarding the details of the survey questionnaires and the frequency of the surveys in this chapter. The chapter ends with an overview of the Townsend Thai Monthly Survey as it will be the illustrative survey we use throughout this monograph. Chapter 4 shows how we apply the concepts from corporate financial accounting to a household survey. Most importantly, we discuss how we modify the standard corporate financial accounting to deal with transactions and situations that are unique to households in developing countries.

Part III of the monograph illustrates how we use the financial accounts constructed from an integrated household survey to study household finance. In chapter 5 we study household finance of two case study households. These are the households that were used to conceptualize the accounts, and we display them here as case studies that show how the accounting data can be used. We use the rest of

the database to provide background statistics to give more meaning to these two case studies, which come from two distinct provinces. Chapter 6 presents an application of our accounts to economic modeling of household finance. Here we borrow the theoretical frameworks and empirical strategies from corporate finance literature and apply them to the study of our households. In particular, we follow the pecking-order hypothesis of a firm's investment financing, and apply the investment–cash flow sensitivity analysis to the study of liquidity and financing of household investment. We also show how non-financial information gathered in a household survey, such as household and village demography, can be integrated into the analysis of household finance, looking at the role of kinship networks in mitigating liquidity constraints of the households. Finally, chapter 7 discusses what we have learned from applying the conceptual framework of corporate financial accounting to household surveys and how we can use financial accounting to improve the design of future surveys. This chapter also presents some limitations in the use of financial accounts when analyzing household behavior. The chapter ends with a discussion on the implications of the conceptualization of this monograph for models of household decision making.

Conceptual Framework

The purpose of this monograph is to better measure productivity, liquidity, risk, financing, and portfolio management in an analysis of high frequency panel data. What emerges is an analogy between households and corporate firms. This chapter provides a conceptual framework that allows us to apply and modify the concepts in corporate financial accounting to the households from high frequency surveys in developing countries. We first argue for the analogy of households as corporate firms in section 2.1, and then provide the background on standard corporate financial accounting as well as discuss how conventional balance sheet, income statement, and statement of cash flows are related to household finance in section 2.2.

2.1. HOUSEHOLDS AS CORPORATE FIRMS: THE ANALOGY

Households in developing countries are not simply consumers supplying factor inputs and purchasing and consuming outputs. Many are also engaged in production in both farm and non-farm activities. In essence, these households function as firms. To understand this analogy, we discuss first in what business activities a typical firm is engaged. Then we present the analogy of households as corporate firms. This analogy serves as our conceptual framework when we construct household financial accounts later in this monograph.

Following Hart (1995), we define a firm as a collection of assets. In order to obtain these assets, a firm has to get the necessary financing.

Two main sources of funds are the creditors and the owners. The owners of a firm are the shareholders. Funds from the creditors are the liabilities of the firm, while funds from the owners are the contributed capital from the shareholders. The firm uses its assets in production activities that potentially generate revenue. After deducting all costs of production, including its corporate income tax, the firm is left with net income. The firm then uses its net income to pay dividends to the shareholders. The remainder of net income goes back to the firm in the form of retained earnings. Retained earnings add to contributed capital, constituting the total shareholders' equity, which is the total claim of the owners on the firm's assets.

Similarly, a typical household performs several activities. A household owns assets such as a house, farmland, livestock and tractors.[1] Again, to acquire these assets, a household gets funds from two main sources: the creditors and the owners. The owners of a household are the *household members*. Funds from the creditors, i.e. the household's debts, are the liabilities of the household. Funds from the owners are the contributed capital from the household members. The household uses its assets in production activities that potentially generate revenue. These activities could be cultivation, aquaculture, livestock raising, provision of labor services, or other businesses. Subtracting all costs of production and personal income tax, the household is left with the after-tax net income, i.e. the household's *disposable income*. The household then uses its disposable income to pay "dividends" to the owners. The dividends come in the form of the *consumption* of household members.[2] The remainder of the net income, i.e. the "retained earnings," is the household *savings*. Savings add to the contributed capital or initial wealth, making the total *wealth* of the household, which is the total claim of the household members over household assets. With positive savings, household assets increase by the same amount as the increase in wealth.

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[1] More generally, household assets also include financial assets such as deposits at commercial banks and informal lending.

[2] This could be viewed as a consumption motive to dividend policy as we discuss later in chapter 7.

Wealth is the residual claim, the assets of the household in excess of its liabilities to the creditors.

To be clear, households are by nature different from firms, especially in terms of their organizational structure and components. One difference is the definition of the household versus the firm. Usually, corporate financial accounting uses a legal definition to identify a corporate firm. A firm is a unit of business entity registered with the government and considered as a judicial person. Unlike a registered firm, a household consists of a collection of individuals. Although each individual does register with the government as a member of a given household, this criterion does not coincide with the definition of household in a typical household survey, where individuals are considered to be in the same household if they live in the same housing structure for at least a certain number of days or they share certain common expenses together.[3]

However, apart from the definition, a household could be viewed as an organization analogous to a corporate firm. Furthermore, we could view an extended household as a conglomerate with multiple divisions, and a nexus of households related by kinship as a business group. Also, the size of a household changes when household members migrate into or out of the household. Migration into a household, possibly by marriage, carrying personal assets that contribute to the total household assets, is analogous to issuing and selling shares to new shareholders in order to capitalize or analogous to a business merger or takeover. Likewise a divorce or dissolution of household could be seen as a spin-off.

Another difference concerns ownership and dividends. The ownership of a registered corporate firm is well defined. Each shareholder owns the firm according to the number of shares she holds. Dividends are usually paid on or defined by the per-share basis. But ownership within a household may be ambiguous. Although we can think of household members as the owners of the household, typically it

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[3] For example, the Townsend Thai Monthly Survey defines an individual as a household member if he or she lives in the same housing structure for at least 15 days since the previous monthly interview.

is not clear what proportion of the household assets is owned by each household member. Similarly, "dividends" paid to each household member in the form of consumption is not typically measured and may not be determined by the member's ownership over the household assets. Note that the implication of considering a household as a monolithic entity is that we assume that the household is a decision-making unit and we ignore any within-household decision-making and bargaining processes. This limits our analysis of distribution within the household although household size, gender ratio, and other household demographic variables could be incorporated into the analysis of household finance, as we show in chapter 6.[4]

Despite these differences, we believe that applying the concepts and methods commonly used in corporate financial accounting to households will help us better understand the behavior of the households, especially their consumption, investment, and financing decisions. Finally, in this monograph we do not consider a household as a separate entity from its business enterprise. We consider the household itself as a firm and construct the accounts for the combined household-firm entity. The rationale behind this decision is that, in developing countries, markets are likely incomplete, hence household behaviors such as consumption may not be separable from production activities.

2.2. OVERVIEW OF FINANCIAL ACCOUNTING

Once we have a conceptual framework that views households as corporate firms, the next step is to apply and modify corporate financial

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[4] There is extensive literature on household bargaining and within-household resource allocation. For the literature on resource allocation within a household, see Duflo and Udry (2004) and Thomas (1990, 1992) for example. Also, although consumption is difficult to measure at the individual or sub-household level, the study of intra-household behavior could rely on labor supply data and jointly-owned assets that could be viewed as household public goods. For example, Chiappori (1992) studies the collective labor supply of the households. Related, Beegle, Frankenberg and Thomas (2001) and Contreras, Frankenberg, and Thomas (2004) look at household bargaining and its effects on health and welfare. Deaton (1997) discusses intra-household allocation and gender bias.

accounting to the households. Standard financial accounting presents the financial situation of a firm in three main accounts: (1) the balance sheet, (2) the income statement, and (3) the statement of cash flows. This section provides an overview of corporate financial accounting concepts, describing what they are and why we need each of them. We also discuss how each account is related to the study of household finance. This background is necessary for the construction of financial statements from a household survey that we present later in this monograph. Unless stated otherwise, the concepts and methods used in this monograph are standard and follow those presented in Stickney and Weil (2002).

2.2.1. Balance Sheet

The balance sheet of a firm presents the financial position of the firm at a given point of time. The major items in the balance sheet are assets, liabilities, and shareholders' equity. Assets are economic resources with the potential to provide future benefit to a firm. Liabilities are creditors' claims on the assets of the firm. Shareholders' equity shows the amount of funds the owners have provided to the firm, which is also their claim on the assets of the firm. Claims on assets coming from shareholders' equity are the excess of assets beyond those required to meet creditors' claims. As a firm must invest somewhere the resources it gets from financing, the balance sheet shows the obvious identity that total assets must equal to the sum of total liabilities and shareholders' equity.

For households, the balance sheet consists of three major items – *household assets*, *household liabilities*, and *household wealth*. Examples of household assets are cash in hand, financial claims such as deposits at financial institutions or informal lending, various types of inventories, and fixed assets such as land, building, and equipment. Household liabilities are debts, borrowed from both financial institutions and people, formally and informally. The residual claim of household members over the household assets in excess of liabilities is the wealth of the household. The wealth of the household changes over time due to either savings out of household net income or to other transactions such as gifts. These savings and gifts could be positive

or negative. Tables A.1 and A.4 in the appendix show examples of household balance sheets from our case study households that we will discuss in detail later in chapter 5.

2.2.2. Income Statement

The income statement is the statement of revenues, costs, gains, and losses over a period of time, ending with net income during the period. Net income is total revenue minus total costs. Revenues are in essence net assets flowing into a firm when it sells goods or provides services. Costs are in essence net assets utilized by a firm in the process of generating revenue. The income statement therefore presents the performance of the operating activities of a firm over a specified period of time.

There are two approaches to the income statement. The cash basis of accounting looks at the revenues and the expenses of a firm as it receives or spends cash.[5] This approach is acceptable when (1) a firm has small changes in inventories, and (2) the purchase of inputs, the production, and the sale of outputs occur in the same period. Otherwise, cash inflows from sales in one, given period could relate to the production and cash outflows from the purchase of inputs in preceding periods. An alternative approach is the accrual basis of accounting where revenues and costs are realized (charged) when the firm sells the output. Therefore, since the revenues and the costs of one period relate to the output from the same activity or asset, the accrual-basis income statement tells more accurately the performance and profitability of the firm in its use of assets rather than the possibly more volatile cash-basis income statement.

Households engage in activities that take several months or years to complete. This is especially the case for households in developing countries where cultivation and livestock raising are common practices. Also, inventories could play an important role, particularly

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[5] In this context, we broadly use the term "cash" to distinguish the "cash basis of accounting" from the "accrual basis of accounting." However, cash does not literally refer to currency. Both accounting methods could include non-cash, in-kind transactions.

for agricultural production, which has high fluctuations of input and output prices over the year. These problems are more acute the more frequently the data are gathered. We thus choose to follow the accrual basis of income when we construct the accounts for the households in developing countries as in this monograph. It is important to keep in mind that the net income of the household presented here is not necessary the *cash* income the household receives. However, we can retrieve the cash income from the statement of cash flows that we will discuss below. Tables A.2 and A.5 in the appendix are the income statements of two case study households that we will discuss in more detail later in chapter 5.

2.2.3. Statement of Cash Flows

The statement of cash flows is a schedule or record of cash receipts and payments over a period of time of the entity with outsiders. The basic idea is that each cash transaction implicitly involves either cash incoming or cash outgoing. The cash-inflow transactions are positively entered while the cash-outflow transactions are negatively recorded. Summing the values of all transactions yields the net change in the stock of cash held by the firm over the period of time. Usually, the transactions are classified according to their functions: operating, investing, or financing.

There are two main reasons why we need the statement of cash flows in addition to the balance sheet and the income statement. First, as just noted, the net income from the income statement under the accrual basis of accounting is not equal to the net inflow of cash from operations. Usually firms have expenses on inputs (cash outflow) before the period of revenue from the sale of the associated outputs (cash inflow). These mismatched flows of funds could lead to a short-fall of cash, or in short a liquidity problem. The balance sheet and the income statement do not provide information on liquidity of the firm. Second, and related, cash inflows and cash outflows may not be from production. Investing and financing activities also involve in cash flows. Examples of these transactions include accumulation of fixed assets, lending and borrowing, dividend payouts, and capitalization by issuing new shares.

By definition, the total cash outflows must equal total cash inflows plus a decrease in cash holding of the firm, i.e. the firm's spending must be financed from somewhere. A firm's financing could be from either (1) internal sources such as operating income or cash on hand, or (2) external sources such as borrowing or the issue of new shares. This identity is commonly known as the cash flow constraint in the corporate finance literature. Equivalently, we could say that total funds from internal and external financing must be spent somewhere.

Analogously, a household faces a similar constraint as stated in its budget equation. Household spending during a particular period must be financed from somewhere – internal or external. We classify each household transaction as falling into one of the three categories: (1) production, (2) consumption and investment, and (3) financing. The equation (2.1) below illustrates a simple budget constraint of a typical household in period t:

$$C_t + I_t = Y_t + F_t \tag{2.1}$$

The left-hand side is the spending of the household, consisting of consumption expenditure, C_t, and investment in fixed assets or capital expenditure, I_t. The right-hand side is the source of funds of the household, consisting of the household's cash flow from production, Y_t, and various financing devices, F_t, such as cash, deposits at financial institutions, borrowing, and gifts.[6] As can be seen, it is sometimes ambiguous how to classify a transaction into these categories. Investment transactions deserve special attention. Conventionally, investment in real fixed assets is considered as a cash outflow in the investment category, called capital expenditure, while investment in financial assets, e.g. lending, is entered as cash outflows in the financing category. Note that an income-generating production activity is separate from financing actions. In other words, if we subtract the cash flow from production Y_t from the left-hand side of the equation (2.1), we define a budget deficit D_t, the excess of cash consumption

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[6] Interest revenues and expenses are included in the total net income, and hence cash flow from production.

and investment expenditures over cash flow from production, to be financed in some ways, F_t. We will return to this point in detail later.

In order to calculate the cash flow from production Y_t, we use household net income from the income statement and make the following relevant adjustments to compute cash flow from production. These adjustments are transactions that involve production activities but are not cash-related. First, we subtract any increase in inventory and any increase in account receivables from net income. An increase in inventory is a cost of multi-period production (including storage activity) that typically involves cash outflow, but it is not yet entered the current period net income calculation. An increase in account receivables, on the other hand, is embedded in the revenue and net income, even though they are not yet paid in cash. Second, we add depreciation and an increase in account payables back into net income. Depreciation was deducted as cost of production even though there was no actual cash paid out. Similarly, an increase in account payables reflects the costs that the household has not actually paid to the suppliers yet. Third, we subtract unrealized capital gains and add unrealized capital losses to net income. Unrealized capital gains were a part of positive income although there was no actual cash inflow. Unrealized capital losses were a part of negative income while there was no actual cash outflow. Finally, we subtract consumption of household-produced outputs from net income to separate within-household transactions from liquidity issue of transactions with the outsiders. Consumption of household-produced items is a part of household income, but it is not a cash inflow.

Tables A.3 and A.6 in the appendix show examples of household statement of cash flows from our case study households that we will discuss in detail later in chapter 5.

2.2.4. Household Consolidated Financial Statements

Household consolidated financial statements consider household's financial situation in aggregate and do not distinguish between different production activities the household performs. The household consolidated balance sheet represents the total wealth of the household. Total assets of the household consist of real assets and financial

assets. Real assets are used in agriculture, business, livestock (including the animals themselves), fish-shrimp farming, and other household activities. Financial assets such as informal lending and formal savings at financial institutions are generally not logically allocated to any particular production activity. The total liabilities of the household are its indebtedness, which mostly consists of borrowing. Household debts could be either for consumption or for production and in the consolidated account we need not distinguish. The household members' wealth is equal to the total assets of the household net of the household members' indebtedness. The household consolidated income statement is the total net income of the household. Again, it is possible that a particular household may be involved in more than one production activity. For example, a farming household may grow crops and raise chickens at the same time. In this case, the household acts as a diversified conglomerate. Similarly, the household consolidated statement of cash flows presents the net flows of cash between the household and other entities outside the household. Again, we do not distinguish among transactions of family members within the household itself.

We use three accounting identities to confirm that our aggregate accounts are constructed correctly: (1) In the consolidated balance sheet, household's total assets must equal the sum of household's total liabilities and household wealth. (2) An increase in household wealth from the consolidated balance sheet must equal the sum of gifts received and savings, where gifts received are from the consolidated statement of cash flows, and savings are the difference between accrued net income (from all production activities) and household consumption from the consolidated income statement. (3) The net change in cash from the consolidated statement of cash flows must equal to the change in cash from the consolidated balance sheet.

Construction of a separate financial statement for each production activity is also possible in principle and desirable in practice. However, in reality it is difficult to pin down the allocation of assets to each activity. Common properties such as housing structure, trucks, and water pumps could be used in various activities – both for production and consumption. For example, a household may own a pick-up truck

that is used in transporting the harvested crop to the market, then buying food for livestock, possibly dropping off children to school, and finally purchasing consumption goods in the market as well. Likewise, a household may borrow, even for a stated purpose, but use the money elsewhere. It is also difficult to estimate the utilization of labor in different activities. Expenses such as articles of clothing would also beg the question of their use in production versus the utility from consumption. We focus in this monograph on the accounts that are consolidated, aggregated over all activities. We thus determined overall income, rates of return to all assets, and aggregate ratios, and set aside for now the issue of rates of return and financing of a particular activity.

Finally, we argue that one of the important features of the household financial accounts constructed using the corporate financial accounting framework is that the measure of accrued income from household enterprises as value added from production (net of depreciation) is consistent with the definition of national income in the National Income and Product Accounts (NIPA). In fact, the private enterprise income account of NIPA is derived from the standard corporate income statements of business enterprises we discuss in this chapter. The saving-investment account of private enterprises is constructed from corporate balance sheets and statements of cash flows. Therefore, these household financial accounts can be used in a study of microfoundations of the aggregate macroeconomy.[7]

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[7] For detailed methodology of National Income and Product Accounts, see Bureau of Economic Analysis (1985 and 2007).

Household Financial Accounting

Household Surveys

Part II of the monograph demonstrates how researchers can construct household financial accounts from household surveys. In this chapter, we argue that the data needed for the construction of household financial accounts must have certain characteristics. They have to be panel data that are preferably collected at a high frequency, e.g. every month. The data must be comprehensive. They must cover a wide range of activities performed by the households and at the same time must be detailed enough to allow researchers to identify individual transactions of the households. This type of data can be obtained from an integrated, panel survey of households.

We start this chapter with an overview of household surveys and their relation to an analysis of household finance in section 3.1. Since the construction of financial accounts utilizes a high frequency survey with detailed questionnaires, we discuss in section 3.2 the trade-offs involved in such surveys. Finally, section 3.3 provides the readers with background on the Townsend Thai Monthly Survey since we use that survey as our illustrative example in this monograph.

3.1. HOUSEHOLD SURVEYS AND HOUSEHOLD FINANCE

Household surveys are essential for researchers to understand household behavior and for governments to design and evaluate policies. In principle, researchers should design a survey to reflect the objectives of their study. There are generally two broad types of household

surveys. The first is a survey that is specific and limited to certain issues. The second, called a multi-topic or an integrated survey, contains a series of questionnaires that span multiple topics. Examples of the integrated surveys include the World Bank's Living Standards Measurement Study (LSMS) surveys and the Family Life Surveys.

Integrated household surveys generally consist of modules for households, communities, and prices. The household module generally asks for individual household information such as demography (composition, fertility, and migration), education, health, employment, production activities and income, consumption, savings, and financing (credits and transfers). Modules on communities and prices include environment and geographic measurements (e.g. rainfalls and temperature), institutions (e.g. local banks and schools), and prices of inputs and outputs sold in the community. The information on community and prices may come from secondary sources (e.g. government statistics), direct observations of the field enumerators, or interviews of key informants of the community (e.g. a village head).

Since an integrated household survey collects information on a wide range of issues, it can be used for the study of households in various aspects. In our context, we would like to study the financial situation and behavior of the households. The issues for us include wealth and income, productivity, liquidity, risk, financing of investment and consumption, and portfolio management. As argued earlier in this monograph, we need to construct household financial accounts from a series of responses to detailed questions, which are generally obtained from an integrated household survey. In addition, several financial issues such as liquidity and inventory management are crucial for the households in the short run. An ideal household survey that serves our research purposes should be conducted at a relatively high frequency, e.g. monthly. The information from the monthly survey provides us with the necessary data for the construction of the monthly household financial accounts that we then use as our workhorse in the analysis of household finance.

Another household survey that collects detailed information on household financial situations and transactions at a high frequency is

the Financial Diaries Project. The financial diary method was originally used by Rutherford (2002) who tracked the financial flows of several dozen households in Bangladesh every two weeks for a year. His objective was to collect information on the financial lives of poor people. He asked the households about their income and expenditure as well as how they saved and protected themselves against risks. Subsequently, Ruthven's (2002) study of households in India improved the method by adding new features into the project, namely the construction of balance sheets for each household, and the inclusion of in-kind transactions in the questionnaire. However, the financial diaries were still mostly unstructured interviews and open-ended discussions. Recently, Collins (2005) made the financial diaries more structured, using a combination of closed-ended and open-ended questionnaires. Her study of approximately 180 households in South Africa during 2003–2005 is so far the biggest set of data from surveys using financial diaries.

The Financial Diaries Project starts with an initial survey that documents the initial condition of the households at the beginning of the survey. Frequent revisits then gather additional information about what has occurred since the previous interview. Unlike integrated household surveys, the Financial Diaries Project mainly focuses only on financial aspects of the households. The questionnaire is comprised of a series of transactions related to household income, expenditure, financing, and savings. The expenditure, financing, and savings transactions are broken down to a very detailed level such as spending on bedding, towels and blankets, or burial plan (funeral insurance). However, the transactions on production activities and income are still broad, asking directly, in the aggregate, regular wages, business revenues, agricultural income from livestock, and agricultural income from crops. Information on non-financial aspects of the households is minimally collected.[1]

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[1] "Financial Diaries: Ongoing Diary Questionnaire," http://www.financialdiaries. com, accessed on November 20, 2008.

3.2. TRADE-OFFS IN SURVEY DESIGNS

There are obvious trade-offs in the design of a high-frequency household survey with detailed questionnaires. In this monograph we focus on two aspects with which researchers, both those who would like to design a questionnaire and those who use the data from a household survey, are typically concerned: (1) the level of detail in the survey questionnaire, and (2) the frequency of the interviews. Obviously, appropriate questionnaire design depends on the objective of the study. Since we are interested in household finance, we will discuss here what problems are inherent to that objective and how to mitigate such problems. Note that we do not focus in this monograph on other aspects of the surveys such as sampling design, though that comes up as related to these two issues.

3.2.1. The Level of Detail

There are several benefits of detailed questionnaires. First, asking a series of detailed questions, especially at the transaction level, may help mitigate recall errors. For example, a household may forget about some transactions that do not involve large flows of cash or are perceived as not germane. These small transactions may add up and constitute a nontrivial part of household's budget. With the balance sheet reflecting cumulative transactions over time, from repeated interviews, the problem confounds the asset side of the ledger. Second, having information at the disaggregated level naturally allows researchers to analyze the use of various devices that are not perfect substitutes. For example, asking for detailed information on each type of assets that each household has including cash, deposits at financial institutions, ROSCA, informal lending to relatives and friends, and real assets (properties and land) provides the opportunity for researchers to study the role of these devices in liquidity, financing, investment, and portfolio management of the households. Of course this cannot be done if the survey were to ask for only the value of aggregates, i.e. overall savings, or, we believe, the saving decision itself. Asking detailed questions could be especially beneficial for surveys conducted in developing areas where accounting knowledge

of the field interviewers and the households can be limited. In such environments, asking broad, aggregate questions may require subjective interpretations of individuals. For example, field interviewers and households may not understand the differences between revenues and income. What are intended of course are gross sales and net profits, respectively. Or responding to a question "What is the total value of your assets?" some households may answer having in mind the total value of the assets gross of the loans used to finance the purchase of those assets while others may answer having in mind net worth or the equity they have over those assets, i.e. net of debt financing. Asking a series of more detailed questions provides natural cross checks and facilitates the common understanding of the intended meaning of the original questions.

However, a detailed questionnaire is not always the best strategy. Although asking a series of detailed questions helps to reduce recall errors, computing the aggregates from the sum of myriad responses may create concern about measurement errors. Also, detailed questionnaires demand more time, both from the interviewers and the households, imposing higher monetary costs to the researchers and higher opportunity costs to the households. We give one salient example from the Townsend Thai Monthly Survey. In the initial design of the monthly instrument, if a household has made a loan, enumerators are to fill in an enumeration of the loan, put it on a roster, and track it in subsequent months. A storeowner in one village was typically selling goods on credit, not cash, and so, to get the information of each individual loan, this part of the interview was taking two or three days per month. We ourselves made the decision after a year or so to limit the number, moving to an enumeration of the detail of the loans up to only the largest three.

Not surprisingly, the more detailed the questionnaire, the more likely it is subject to limited sample size. We have focused in this monograph on the Townsend Thai Monthly Survey, covering 16 villages and roughly 720 households in the central and northeastern regions. This is one cluster of four villages in each of four provinces. On the other hand, the Townsend Thai Annual Resurvey covers 64 villages for an additional 950 households and a larger geographic scope, with

four clusters per each of the four original provinces. This survey has been more easily carried into additional provinces in the north and the south, and now into urban areas also. The intensive monthly data collection has not been expanded to other areas, tempting though it may be. Further illustrative tensions between detail and sample size include that the original, relatively large survey of 2,880 households in 92 villages has not been repeated at all. Fortunately, however, there is some overlap, as the large initial survey led to the annual resurvey, and the monthly surveys were a spin-off from that. We hope to exploit that overlap and differences in the way questions were asked to return to a more rigorous assessment of the trade-offs in detail and frequency.

3.2.2. Frequency of the Survey

High frequency surveys allow for the analysis of short-term household behavior that is easily concealed in annual, or even quarterly data. For example, short-term liquidity and inventory management are important, especially for agricultural households whose cash outflows from input purchases and cash inflows from output sales occur in different months. A typical rice farmer has negative income though much of the year, saved by a large spike at harvest. How this is managed is of considerable interest, especially with perceptions that the poor are especially vulnerable. Related, high frequency surveys are needed for the analysis of other seasonal behaviors such as migration and remittances. We can see elder children supposedly in residence for the year spending large amounts of time outside of the villages. The Thai labor force survey may overstate the fraction of the population in rural areas, for that reason. Again, interviewing the households on a high frequency basis may help mitigate recall errors. Some annual surveys ask households to recall transactions over the recent, short period, such as seven days or last month, then extrapolate the response to cover the whole year. Although this strategy reduces recall errors, it is subject to measurement errors if the spending of that particular week or month is not representative consumption of the household throughout the year. For example, in the Townsend Thai Monthly Survey, monthly expenditure on alcoholic beverage

was high for most of the households during December and January, likely due to the New Year celebration.

That said, there are limits to frequency. The Townsend Thai Monthly Survey began with the intention of gathering consumption expenditures data every week. This again proved too intensive, and we shifted to bi-weekly interviews. We have conducted a preliminary analysis of the change, and it seems that expenditures are somewhat understated with this lower frequency. In turn money in hand may be overstated, as we anticipated earlier (for an improved design see the discussion in chapter 7). On the other hand, de Mel, McKenzie and Woodruff (2009) randomly provided a ledger book to households in Sri Lanka in order to keep a diary. It seems from their study that recall errors do not matter much for the key ultimate net income variable.

From Townsend Thai Monthly Survey effort, we encounter two additional problems peculiar to a high frequency survey. Though there are economies in cost from having in-resident enumerators in the village, interviews necessarily take place continuously. This makes construction of the discrete time panel a bit problematic. Some households may get interviewed around the beginning of the month while others are interviewed toward the end. In calendar time the interviews of the latter are actually closer to the interviews of the former households at beginning of the following month. Thus risk-sharing regressions and other regressions with common time dummies are a bit misleading and potentially spurious. Second, even high frequency surveys with once a month interviews miss the exact timing of planting, and of other inputs and operations within each month, and so we lose the connection to daily rainfall, temperature, and other environmental features. Combining biophysical models of crop production using daily rainfall and temperature with the monthly household data remains a challenge.

3.2.3. High Frequency Household Survey with Detailed Questionnaire

Despite the problems with high frequency data and detailed questionnaires, this kind of survey can be invaluable in the study of certain

decisions. We list here the situations for which a high frequency, detailed survey is necessary.

First, high frequency data is necessary for the analysis of liquidity, the short-term smoothing of consumption, the protection of investment from cash flow fluctuations, and the financing of cash flow budget deficits. In order to study liquidity and separate it from productivity, detailed balance sheet, accrued income statement, and statement of cash flows are needed. If these accounts are to be constructed for each household-month, information from a detailed questionnaire is needed. Such high frequency data and the accounting framework become more relevant for the households engaged in multi-period activities. For example, for business households, there are timing differences between inputs acquired and revenue received for transactions with trade credit. Note that de Mel, McKenzie and Woodruff (2009) find that asking questions on revenues and expenses without considering the timing mismatch between sales and associated purchase of inputs is a major cause of the differences between reported profits and the alternative revenue-minus-expenses. Their finding further reinforces our plea for high frequency data and the careful treatment of the timing of transactions when analyzing the activities involving multiple periods.

Also, as villages in developing economies might be thought to have imperfect financial markets, liquidity constraints may be crucial, especially when the maturity of assets does not match with the maturity of liabilities. A household may run a business that is profitable in the long-run perspective (i.e. having positive net present value and high return on assets), but the business may not survive through a period when the inflows of revenues are limited if it has no liquidity. For example, a business may have a large portion of its sales as long-term trade credit and cannot generate enough cash inflow to pay back short-term loans. In this situation, high frequency data help us understand the short-term financial vulnerability of the households and the behavior of others seeking to avoid this situation.

Related, as we show later in chapter 6, the fixed investment of relatively poor households is sensitive to the cash flow in the very same month as the investment event. This sensitivity fades away if we take

cash flow over the previous three months, or six months. These results suggest that if we had collected the data at quarterly or semi-annual frequency, we would not have found such households to be constrained in liquidity. Of course it helps us in this calculation that we can control for future profitability of the investment via the realized return on assets, something that requires the accrued income statement.

Detailed questionnaires allow us to distinguish between accrued net income and cash flow from production. From the two case studies of households in our sample (chapter 5), one seems to have consumption responding to cash flow and the other to accrued net income. Although we do not yet understand well the underlying behavior, this finding suggests that the difference between cash flow and net income matters to the households and shows up in conventional tests of permanent income hypothesis and risk sharing. A detailed questionnaire is also needed for the construction of the household balance sheet that distinguishes between household assets and household wealth, net of liabilities. This is important as it also distinguishes between return on household assets and return on household wealth (equity). Note that this information can be gathered by a series of simple questions on household transactions without imposing on the field enumerators' and the household's prior knowledge of financial accounting.

Again, transaction-based questionnaires allow us to construct detailed balance sheets and statements of cash flows with detailed sub-items. For example, various financial and real assets have different liquidity so distinguishing between them can be crucial. These assets also yield different rate of returns and are subject to different risks. Studying how households in developing countries with limited access to formal financial markets save and invest naturally requires the detailed balance sheet and statement of cash flows. We are in the process of understanding their portfolio choices through the lens of modern financial theory.

Finally, extensive information on household consumption, production activities (inputs, inventories, and outputs), various real and financial assets, and other relevant data on demographic characteristics of the same households are necessary for the study of households in developing economies where markets are incomplete

and consumption and production decisions are not separable. This argument is emphasized and extensively discussed by Singh, Squire and Strauss (1986), who call for an integration or coordination of household budget surveys with farm management survey of the same households.

3.3. THE TOWNSEND THAI MONTHLY SURVEY

Since we will use the Townsend Thai Monthly Survey to illustrate how to construct household financial statements from household surveys, this section provides an overview of the Townsend Thai Project in general and the Townsend Thai Monthly Survey in particular. Detailed description of the project can be found in Paulson, Sakuntasathien, Lee and Binford (1997). It is important to note that although the survey was designed to collect most of the detailed financial information of the households, the questionnaires were not written with the financial accounting framework in mind from the outset. We address possible improvements for future survey design for the construction of household financial accounts in chapter 7.

3.3.1. Background of the Townsend Thai Project

The Townsend Thai Project is carried out in Thailand under the direction of Khun Sombat Sakuntasathien and dedicated staff. The project is administered in the United States at the National Opinion Research Center (NORC) and the University of Chicago. Survey design and initial research collaborators included Anna Paulson of Northwestern University, Tae Joeng Lee of Yonse University, and Michael Binford of the University of Florida. Though the project in Thailand has evolved, it currently consists of four regional offices with headquarters in Nakon Pathom province. There are approximately 70 full-time staff in Thailand. Current funding for the Monthly Survey includes strong support from the University of the Thai Chamber of Commerce (UTCC). Research support in the US now includes the John Templeton Foundation and the Bill and Melinda Gates Foundation, with additional research and infrastructure at Massachusetts Institute

of Technology as well as the University of Chicago. Over 30 researchers have been involved in projects with the data. Robert Townsend is the overall project director and principal investigator.

The purpose of the initial project funded by the National Institute of Child Health and Human Development (NICHD) and the National Science Foundation (NSF) was to evaluate the role of informal institutions such as the family and local networks in supporting the welfare and well-being of individuals in semi-urban and rural areas of Thailand. Risk and the potentially adverse and direct consequences of household-specific and firm-specific shocks are a key part of project. The mediating role of the family and social and economic networks in the mobilization of savings and allocation of credit was also deemed essential. These networks are not viewed in isolation but rather are part of the larger village, regional, and national financial system. Thus the project includes an evaluation of village-level financial institutions, such as Production Credit Groups (PCG) and rice banks, as well as national-level financial institutions such as commercial banks and the government's Bank for Agriculture and Agricultural Cooperatives (BAAC). Indeed, the project has both micro and macro aspects. It seeks to evaluate informal and formal financial institutions and markets and to construct and evaluate macroeconomic models of growth, fluctuations, and crisis. The macro models are based on the measured micro underpinnings.

A relatively large initial, cross-sectional survey, carried out in May l997, was designed to obtain reliable information on the existence and the use of formal and informal mechanisms and institutions, in order to assess and then model the impact of high growth with increasing inequality and uneven financial deepening. Briefly, aware of heavy regional disparities, this initial survey was fielded in two distinct regions of the country: the industrialized and fertile central region, and the semi-arid and relatively poor northeastern region. The survey included separate instruments for the households, village headmen as key informants, local financial institutions, and joint-liability BAAC groups. Approximately 23% of the interviewed households were also running some kind of business. There are also direct measurements of the local village environment. Soil samples were also taken,

administered with a separate soil questionnaire and plot photos. Finally, there are aerial photos of each of the survey villages, going back three decades.

The devaluation of the Thai baht (THB) in July l997 and the unexpected Asian financial crisis led to the realization that, with the initial May 1997 benchmark survey, the project was in good position to track the impact of the crisis on households and businesses, and to understand the micro-underpinnings of the movement in the macro variables. This realization led to the Annual Resurveys. Briefly, in May 1998, one-third of the original sample of villages was resurveyed with financial support from the Ford Foundation. Additional NICHD and NSF funding has continued these ongoing resurveys. Along with the initial survey, these constitute at present more than ten years of household and business panel. In addition to the household instruments, there were continued resurveys of headmen and village institutions, and in 2000, the BAAC groups. The initial survey and annual resurveys have now been extended to four additional provinces in the northern and the southern regions, as well as into towns and cities in all these provinces including the original four in the central and the northeast.

3.3.2. The Townsend Thai Monthly Survey

In accordance with the initial project design, an intensive monthly survey was initiated in August l998 in a subset of villages from the original sampling frame. The selection controlled for the environment and deliberately sought variation in informal networks, local village institutions, and use of national-level institutions. The goal was to provide a micro-level evaluation of family networks, markets, and institutions. This household survey included (1) an initial census, (2) a baseline interview on initial conditions of sampled households, (3) forms that gather information on the use of contracts and informal institutions, and (4) monthly interviews to track changing conditions. Environmental data are gathered courtesy of grants from the Mellon Foundation and the University of Chicago. This includes soil analysis, plot photos, daily rainfall, soil moisture, water chemistry, and other bi-weekly water measurements. This data collection effort is still ongoing at the time we write this monograph.

In total, there are 16 villages, four villages in each of the four original provinces (changwats) in the central and the northeastern regions. The provinces are Chachoengsao and Lopburi in the central region, and Buriram and Sisaket in the northeast. Specifically, one district (tambon) per province was chosen from the 12 possibilities of the initial 1997 cross section. The selected district in each province displayed relatively little variation in the collected environmental variables across the four villages but relatively high variation across the four villages in the collected economic institutional variables: informal networks, local village institutions, and use of national-level institutions. This selection was consistent with a primary goal of the overall project: a micro-level evaluation of family networks, markets, and formal institutions in credit and insurance. As the selected district in each province was already surveyed in the initial 1997 cross section, 15 of the households in each of the four villages had been interviewed previously, and soil samples had been collected. Thirty additional households were added so that the total number of sampled households in each village would be 45 per village. The overall target therefore consisted of 720 households.

This monthly survey began with an initial village-wide census. Every structure and every household was enumerated and one individual per residential structure was interviewed about individuals who slept or ate in that structure. Thus all individuals, households, and residential structures in each of the 16 villages could be identified in subsequent, monthly responses.

The survey itself began in August 1998 with a baseline interview on initial conditions of sampled households. These answers triggered various forms which gathered more specific information on the use of contracts and informal institutions, for example. Rosters provide an enumeration or list of items to be tracked in subsequent monthly interviews such as individual household members, loans, and assets. The monthly interviews themselves track inputs, outputs, and changing conditions. As activities of a household may change, new forms are occasionally administered.

Environmental data were gathered initially by the grants from the Mellon foundation and the University of Chicago, though they are now

standard project costs. There is one rain gauge per village and 20 soil moisture/stress meters per village. In addition, in the first 12 months there was water chemistry analysis. Other water measurements have continued. The soil samples with plot photos and soil questionnaire for each of the households were collected. Thus the environmental measurements include soil analysis, plot photos, daily rainfall, soil moisture, water chemistry, and other bi-weekly water measurements.

3.3.3. Comparing the Townsend Thai
Monthly Survey with Other Surveys

The Townsend Thai Monthly Survey shares similar characteristics with other household surveys. Like the World Bank's Living Standards Measurement Study (LSMS), the Townsend Thai Monthly Survey consists of multiple modules that capture household information on demography, labor and employment, production activities (cultivation, livestock, fish and shrimp, business enterprises, labor provision, and other income-generating activities), fixed assets, savings and financing (deposits, lending, borrowing, and gifts), consumption, and health. The Townsend survey also collects information on environmental measurement. However, the survey does not directly collect the information on prices of inputs and outputs sold in the village in a separate module. Instead, when any transaction occurs, the survey asks for both the quantity (e.g. in kilograms) and the monetary value (in baht), allowing us to compute the average price of the product. The main difference between the Townsend Thai Monthly Survey and the LSMS is the frequency of the resurveys. As reported in Grosh and Glewwe (2000), only 17 out of 32 of the countries with LSMS surveys have repeated surveys and the resurveys were not conducted on a high frequency basis. The Townsend Thai Monthly Survey consists of the monthly resurveys that have been conducted since September 1998 and still continue at the time we write this monograph.

The Townsend Thai Monthly Survey also shares similar features with the Financial Diaries Project. Both are panel surveys that collect information from the household on a high frequency basis, monthly for the Townsend Thai Monthly Survey and bi-weekly for the Financial Diaries Project. The Financial Diaries Project, however, collects

information mainly on financial transactions of the households, and gathers less information on production activities and other aspects of the households. Consequently, financial diaries provide adequate information for the construction of household balance sheets and statements of cash flows. However, financial diaries do not provide sufficient information for the construction of income statements of the households with multi-period production activities, inventory management, or trade credits. In sum, although the financial diaries serve the main objective of researchers who are interested in the financial situation and flow of funds of the households, the diaries do not provide other information that is related and crucial for greater understanding of household finance such as productivity of household enterprises.

Constructing Household Financial Statements from a Household Survey

We discussed in chapter 2 that we can view a household as a corporate firm. We also presented the standard corporate financial accounts and argued for the advantages of creating and using the accounts for the analysis of financial situations and behaviors of the households. However, there are some characteristics that make the household and the firm different. The objectives of the studies of household and firm behavior are also not identical. Several transactions are also unique to the households in developing countries. Therefore, some modifications of the financial accounts are needed. This chapter highlights some of the important issues where special attention is needed.

As mentioned earlier, the principle contribution of this monograph is the conceptualization of the accounts. We do this in order to avoid ambiguous and mis-measured variables that would otherwise contaminate subsequent analysis. This necessitates some difficult decisions on how to deal with some unusual transactions. When we make an arbitrary decision from several possibilities, we discuss the reasons why we prefer our method as compared to possible alternatives. We use the Townsend Thai Monthly Survey discussed in chapter 3 as our illustrative survey to address these issues although the discussion in this chapter is largely applied to other household surveys in developing countries as well.

4.1. TANGIBLE ASSETS, LIABILITIES AND WEALTH

To construct a balance sheet for each household, we need information on tangible assets and liabilities. As argued by Stickney and

Weil (2002), corporate financial accounting has never satisfactorily defined the distinction between tangible and intangible assets. Typically, accountants define intangibles by giving an exhaustive list, and everything not on the list is tangible. In this monograph, however, we explicitly define tangible assets to include physical and financial assets. Intangible assets are education and health human capital as well as other assets that are not tangible.

Many household surveys get information on initial assets from a baseline survey. For example, the Townsend Thai Monthly Survey questionnaires ask whether a household owns certain types of assets such as television, motorcycle, automobile, tractor, sprinkler, water pump, chicken coop, building, and other valuable assets. Households are asked when each asset was acquired and the value of the asset at acquisition. A depreciation formula can then be used to get current values. Exceptions are land and fishponds, which in the Townsend Thai Monthly Survey are not depreciated. Alternatively, as in the Living Standards Measurement Study (LSMS) surveys, respondents are asked how much they could obtain for an asset if it were sold at the time of the interview. Financial assets such as deposits at financial institutions and lending to other households are typically given nominal values as amounts owned or due, distinguishing principal from interest. Questions are also administered in the Townsend Thai baseline instruments about crop inventories and business inventories. A decision was made not to ask about initial cash holding or the value of jewelry or gold as this was viewed as too intrusive and could put the rest of the survey at risk. As to liabilities, the household is asked in the initial baseline for an enumeration of principal and interest due.

The difference between assets and liabilities in the initial, baseline survey is the household's initial wealth. We treat this initial wealth as equivalent to contributed capital in the corporate financial accounts. Although we do not have the information on the source of this capital (in-coming gifts versus net savings) prior to the initial baseline survey, the periodic resurveys can make this distinction. The difference between net income and consumption, i.e. household savings, adds to the household wealth in the same way that retained earnings add to a firm equity. A deficit similarly subtracts from the household wealth.

With panel data, interviewers go back to the households and update more current information from the events since the last interview. In the Townsend Thai Monthly Survey households are asked about acquisitions of assets (e.g. purchase, gift, the birth of livestock) and disposals of assets (e.g. sales, loss, giving out of assets, and the death of livestock). The survey also asks the associated values of each asset transaction. Deposits and withdrawals of savings are tracked. Questions are asked about changes in inventory. New borrowing since the last interview and repayment of previously held debt are measured. If the resurvey questionnaires distinguish in-kind versus cash transactions, then one can estimate changes in cash holdings. If we make an additional arbitrary guess about initial balances, then we can enter cash in hand to the balance sheet in each month.

Following a convention in corporate financial accounting, financial assets and liabilities appear on the balance sheet at their net present cash value. Non-monetary assets such as land, building, and equipment appear at acquisition cost. We then adjust downward the non-monetary assets, except for land, to reflect depreciation (see section 4.8). The acquisition value of land may underestimate the current value of household's total assets. However, this problem is minor in the Townsend Thai Monthly Survey as we do update the value of land when there is a major change on the plot such as new road constructed nearby or other land improvements (e.g. digging a pond). We think that the approach we propose in this manuscript is less subject to measurement error as compared to estimating the present value of the land every month. The main reason is that the market for land is thin, making the current price for land unavailable or unreliable. This is also the reason why the standard corporate financial accounting adopts the acquisition value rather than evaluating the present value of land.[1]

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[1] In fact, we do ask the households in our survey about their assessment of the value of land. However, their assessment does not change much over time unless there are substantial improvements on land, which we have already taken into account. This is consistent to the fact that land market in rural area is not liquid so the current market price is not available.

4.2. HUMAN CAPITAL AND OTHER INTANGIBLE ASSETS

Balance sheets in standard corporate financial statements do not include some intangible assets such as patents, trademarks, and goodwill, as they are difficult to quantify and value. For households, intangible assets such as human capital are of potentially great importance. Human capital as an asset may generate a large share of household income. Households vary in size and gender composition. Household members also have different education attainments, work experiences, skills, and health conditions.

Unfortunately, to our knowledge there is no reliable way to measure directly the value of the *stock* of human capital. Many studies on human capital use the combination of headcounts, education, and experience as a proxy for the stock of worker's human capital.[2] Other studies focus on the *flow* of the service of human capital as measured by wage or earnings.[3] One of the closest attempts to estimate the monetary value of the stock of human capital and other intangibles is an indirect approach used by the World Bank (2006), which defines the value of human capital and other intangible assets of a country as a residual of the total wealth of the country that is not accounted by the country's produced capital and natural capital. Total wealth is

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[2] For example, Barro (2001) and Barro and Lee (2001) use education attainment as their proxy for human capital in cross-country growth regressions. Moretti (2004) uses the numbers of educated workers and uneducated workers as proxies for the stock of human capital in a city.

[3] For example, Abowd, Haltiwanger, Jarmin, Lane, Lengermann, McCue, McKinney and Sandusky (2005) suggests an empirical approach that incorporates labor data to estimating the contribution of human capital in firm production. They define human capital from wage regressions as the sum of the person-specific fixed effect and the overall labor market experience of each worker captured by the experience component in the regression. They can then take into account the productivity component of the workforce of each firm, a measure that evolves over time with the worker-firm match. Related, recent work by Cunha and Heckman (2008) allows for a vector of unobserved skills, components that vary over time and states. But these are all measures of human capital and skills which are derived in analysis of measured variables such as wages in conjunction with a model. At best, test scores are an indicator of skills but the underlying human capital vector is not measured directly. Rather it is inferred. These approaches can be taken to the Thai data, as well.

computed from the present value of future consumption; produced capital from a perpetual inventory model; and natural capital from country-level data on natural resource stock and estimates of natural resource rents, taking into account world prices and local costs. Although this approach allows us to estimate the value of total wealth, it is subject to specific assumptions on future consumption and discount rate, potentially creating measurement errors. In addition, the approach does not take into account that investment in capital could be financed not only by wealth or equity, but also by debts.

Without a reliable method to estimate the value of the stock of intangible assets, we follow the convention in corporate financial accounting and do not include human capital in our balance sheet. Although this is not an ideal solution, we believe that this approach is less vulnerable to measurement error than the alternative of quantifying the stock of human capital into a monetary value and adding it to other assets. Any alternative depends on the specific statistical, econometric, or structural model being used to make inferences about the stock.

The omission of intangible assets is a general problem in economics and finance and by no means specific to our approach. Again, it appears as a problem in corporate financial statements that fail to account for organizational assets, innovations, and goodwill. Although our financial accounts do not capture the value of human capital in the balance sheet, and this creates a bias in the estimates of the rates of return, the approach we use does help us identify the direction and the source of the bias in such estimates. Likewise, we take into account the omission of human capital when we interpret some of the results of the analysis.

We illustrate with one example here. In chapter 5 we compute the conventional return on total assets as the ratio between net income and total assets. We know that excluding human capital from total assets in the balance sheet while including wage earnings in the statement of income leads to an overestimate of the return on total tangible assets. However, in many cases we are interested in the rate of return on total tangible (physical and financial) assets or the rate of return on fixed assets of a given household. These cases include the

study of household investment or establishment of household business enterprises. We use other information in the questionnaires that helps us estimate the return to invested tangible assets by subtracting off the counterfactual opportunity cost or wage that household members would have earned in external labor markets. Again, we discuss this adjusted rate of return in more detail in chapter 5 of this monograph.

4.3. GIFTS AND TRANSFERS

Gifts and transfers received by a household are special transactions since they contribute to the wealth of the household without being directly related to the production process. That is, gifts are not a part of net income from production activities per se. In this section, we first provide our general treatment of these transactions, and then discuss issues related to two special types of gifts and transfers to a household that deserve further attention, namely remittances and government transfers.

4.3.1. General Treatment of Gifts and Transfers

In corporate financial accounting, donations received by a firm are credited to shareholders' equity under a special line item called donated capital.[4] They however do not enter the income statement of the firm since they do not impact the profits or losses of firm's production activities. National Income and Product Accounts (NIPA) treat gifts and transfers to a household differently. Although gifts are not related to production and are not included in national product calculation, they are a part of the personal income of the household in the

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[4] The term *donated capital* is used in order to distinguish donations from contributed capital. Gifts or donations involve assets flowing into the firm without issuing shares or other owners' equity interest in return. Although we define contributed capital as total initial wealth of the household without distinguishing whether the initial wealth was from past savings of the household or gifts received in previous periods, subsequent gifts received by the household are recorded in a separate accounting item as cumulated net gifts received. As we discuss later in this section, a person who provides gifts to a household may have claims over the household assets, although the claims are implicit.

personal income and outlay account of NIPA. In this monograph, we decide to follow the guideline from corporate financial accounts, i.e. not treating gifts and transfers as income, for two reasons. First of all, we are interested in the productivity of the household enterprise, which argues for using net income derived only from production activities. Also, gifts are commonly observed in developing economies as a financing mechanism, which argues for the treatment of gifts and transfers as cash inflow from financing. In the terminology of NIPA, we view household's accrued net income in this monograph as the value added from the household's production activities (net of depreciation) similar to the net national product (NNP) rather than the personal income.

Specifically, when a household receives a gift, e.g. in the form of cash, we record it as a cash-inflow transaction in the statement of cash flows. Simultaneously, the cash in hand of the household increases by the same amount so we add the value of this gift to the cash in hand item on the asset side of the balance sheet. Unlike borrowing, the gift is not a household's liability as it is not a simple debt. Also, as noted, the gift is not a part of the household income from production so it is not a part of the savings of the household either. Instead, we create a new line item under household wealth called cumulative net gifts received. Any gifts received are added to this item in the balance sheet. In the end, an increase in cash holding in the current period relative to the previous period on the asset side is identical to an increase in household wealth on the liability and wealth (equity) side. This increase in cash is also identical to the change in cash in the statement of cash flows as a cash inflow from financing. Likewise, giving cash to others is considered as a cash outflow in the statement of cash flow and is also subtracted from cash holding and cumulative net gifts received in the balance sheet. Note again that this transaction never enters the income statement.

An in-coming gift is interpreted as an increase in wealth, and it is comparable to new equity issued to shareholders in a firm's capitalization activity. The new shareholders have claims on the (additional) assets of the firm. Similarly, non-altruistic gift providers, who naturally expect reciprocity, also have *implicit* claims on household assets.

However, the claims of the gift providers may have less seniority than the claims from the creditors and the members of the household. They have such low seniority that laws do not protect them.[5]

Note that since we list gifts and transfers as a separate item in the household's statement of cash flows (under financing activities), we can compute household personal income directly from our accrued net income plus net gifts received. Consequently, an increase in household wealth comes from two sources: gifts received and household savings. Again, in our context, household savings are defined as accrued net income less household consumption. This definition of savings for our households is therefore slightly different from what defined for the households in NIPA, i.e. personal income less consumption. Our savings, however, is consistent with retained earnings in corporate financial accounts, which make a distinction between an increase in shareholders' equity from retained earnings versus an increase from donations or transfers.

4.3.2. Remittances

Remittances are resources given to a household by someone who lives in a distant location and does not reside in the same building structure as the household. By our definition of the household in the survey, the person could be a migrant and therefore is not considered as a household member, even though the person might well be a familial relatives. Examples of these individuals in the Townsend Thai surveys include children of the household head who live and work in Bangkok or other provinces, and occasionally send money back to their parents living in the village. Consequently, we have to treat remittances in the same way as other gifts. They are not entered into household income statement. They are simultaneously recorded as an increase in cumulative net gifts received and an increase in assets in the balance sheet, and as cash inflow under the financing category in the statement of cash flows.

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[5] In fact, the household may provide gifts back voluntarily in expectation to receive more gifts in the future, or the household may be forced to reciprocate by the social norms.

Alternatively, some household surveys may attempt to follow individuals even when they have moved out and no longer live in the household's building structure. This is the case for the Yale Economic Growth Center surveys in Ghana and Tamil Nadu. In such cases, the definition of a surveyed household could be changed so that the household would still include a member who lives at a distance but sends money back home, given that they share the pool of resources and collectively make certain household decisions together. The remittances from this person would therefore be counted as a part of household labor income.[6] The bottom line is that the treatment of remittances as gifts versus labor income depends on the definition of households in the survey.

4.3.3. Government Transfers

Households in developing countries sometimes receive transfers from the government. These transfers could be cash or in-kind (such as free seeds, fertilizer, or other inputs). Government transfers also include education scholarship or medicine. Since these transfers are not compensation for outputs produced by the household, we treat them the same way as other gifts discussed earlier. Again, these transfers are not entered into household income statement. They are recorded as an increase in cumulative net gifts received and an increase in household assets in the balance sheet, and as a cash inflow under the financing category in the statement of cash flows.

There is an exception, however. Consistent with concepts in national income accounts, we treat retirement income of household members in the same way as household labor income. Actually if this is a payment for past services rendered and we view the household as a firm, then this payment is equivalent to a profit from business. After all, that is the way we are treating other labor income as compensation for labor services provided. We record this transaction under labor income in the income statement.[7] In the balance sheet, it is entered

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[6] This is similar to remittances from a national citizen working abroad being counted as national income in NIPA.

[7] Alternatively we could record it separately under transfers or (negative) taxes.

as an increase in assets and in cumulative savings, while it is a cash inflow from production in the statement of cash flows.

4.4. INVENTORIES AND MULTI-PERIOD PRODUCTION

Many households in developing economies are engaged in farm and non-farm production activities that span over more than one period. These activities include inventory storage and multi-period production. We consider each of them in this section.

4.4.1. Inventories

Our treatment of inventory deserves a detailed discussion. In principle, if an increase in inventory is an inherent part of the business, then it is entered in the statement of cash flows as a cash outflow associated with production. Alternatively, one can view inventory accumulation as the acquisition of a fixed asset, hence an outflow in the investment account. Finally, similar to financial assets, inventory can be viewed as a financing device. A household may purchase and store its inventory in good times and use it to finance consumption expenditure in bad times. However, it is difficult in practice to know which part of an increase in inventory is to be used as input material in production activities like cultivation, which part is more like a fixed asset used as a machine in production, and which part is kept as the household's buffer stock, i.e. as liquid assets.

For households that hold inventory as working capital (say, retail business or even agricultural households with work-in-process inventory), changes in inventory are to some extent exogenous, and dictated by a product cycle, supply condition, or market demand. In this case, the ultimate sale of inventory should be considered as income. For households that hold inventory strategically (say, agricultural households that hold crops in inventory, waiting for the crop price to rise), the sale of inventory should also be considered as income-generating activity as that storage provides a risk bearing service. However, when households hold inventory as a buffer stock, i.e. much

like financial savings, then we should consider the inventory as a deficit financing device, which is a transaction under financing and not production. Again, it is hard to draw these distinctions. We decided in our construction of the accounts to include the change in inventory as related to cash flow from production and to treat the capital gain or loss from holding inventory as a revenue or cost of a storage activity. This assumption implies that inventory change does not show up as a smoothing device, as net proceeds are already included in income. In other words, inventory is not treated as a buffer stock. One should thus be careful when interpreting the results regarding the smoothing of deficits in cash flow. Fortunately, with the accounting framework in hand, researchers can easily re-adjust the way they want to deal with inventory. For example, if the sample consists of mostly subsistence households that use inventory as their buffer stock, the researcher may choose to include the change in inventory in the cash flow statement under financing rather than production, making the use of inventory as a smoothing device explicit. We stress again that the accounting framework helps us systematically organize inventory transactions in the way that is precise yet flexible in applications.[8]

Even for non-buffer stock households, it is sometimes unclear how to draw a sharp line between inventories and fixed assets. In the standard financial accounting, the term inventory means a stock of goods or other items that a firm owns and holds for sale or for further processing as a part of its business operations. A merchandising firm acquires inventory items in a physical condition ready for sale while a manufacturing firm transforms raw materials into finished products often held for a time in its factory. Stickney and Weil (2002) give as an

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[8] There is also a related issue for inventory in NIPA. Investment in NIPA consists of three main components: investment in business fixed assets, investment in real estate, and investment in inventory. That is, inventory is treated as an asset and the change as an investment. Usually inventory accounts for goods produced (value added) that are not yet purchased so that we have the identity $Y = C + I + G + (X - M)$. Y is aggregate output and the right-hand side is aggregate demand or expenditure. If output is greater than expenditure, then the unsold goods are recorded as increase in inventory, which is a part of aggregate investment.

example tools that are inventory of a tool manufacturer or of a hardware store, but not of a carpenter who uses the tools (assets) in his production activities. We use these criteria to separate inventory from fixed assets in our framework and include the following items in our inventory: cultivation input inventory (such as fertilizer), cultivation work-in-process inventory (such as not-yet-harvested crops), cultivation finished-goods inventory (such as harvested rice grains), livestock input inventory (such as animal feed), livestock work-in-process inventory, livestock finished-goods inventory (such as chicken eggs), fish input inventory, fish work-in-process inventory, fish finished-goods inventory, business input inventory (such as cloth for a tailor), business work-in-process inventory (such as unfinished furniture for a carpenter), business finished-goods inventory (such as pottery and local liquor), and business goods for resale (for a retail store). These inventories are a part of working capital of the business, held for the purpose of business as usual, and therefore are not considered as fixed assets.

4.4.2. Multi-Period Production: Cultivation, Livestock and Non-Retail Business Activities

The LSMS and other integrated household surveys do not measure net income directly in a single module but gather information on revenues and costs in a series of activity modules: cultivation, aquaculture (fish and shrimp), livestock activity, personal or family business, and labor services. In order to take into account the difference in the timing of acquisition, uses, harvests, and sales of inventories, the Townsend Thai Monthly Survey asks first for the (value and quantity of) inputs acquired since the previous interview and then for the actual (value and quantity of) inputs used on land plots. Likewise, the survey asks for the (value and quantity of) outputs harvested since the previous interview and then the (value and quantity of) sales, household consumption, gifts, and storage. An inventory account can thus be constructed.

These issues of timing, input purchased and used, and output produced and sold, are not trivial and lie at the heart of the distinction between accrued income and cash flow from production. Consider the following simple example. Suppose that a household purchases

rice seeds for $100 in cash in period 1, but has not yet planted them. On the balance sheet, the cash in hand of the household will decrease by $100 while the input inventory will increase by the same amount. There is no change in the household's total assets or wealth. On the statement of cash flows, we record the $100-outflow transaction under the increase in inventories. This transaction does not affect the income statement. The seed expense is not yet treated as a cost of production as the household has not yet sold the output.

In the second period, the household plants the seeds carried from the previous period. On the balance sheet, the input inventory decreases by $100 while a work-in-process inventory increases by the same amount. There is no change in total assets or household wealth. This transaction affects neither accrued income nor cash flows. Note that even though the input is now employed in production, it is still not treated as an expense in production under the accrual income concept.

In the third period, the household spends $20 to purchase chemical fertilizer and uses it on the rice plot. On the balance sheet, cash in hand decreases by $20 while the value of the work-in-process inventory increases by the same amount. This $20-outflow does appear in the statement of cash flows under the increase in inventory item. Note that the total value of the work-in-process inventory is now $100 + $20 = $120. There is still no entry in the income statement.

In the fourth period, the household harvests the crops and gets 500 kilograms of rice. The household puts this rice in its storage facility. Under the typical standards of corporate accounts, on the balance sheet, work-in-process inventory decreases by $120 while the finished-goods inventory increases by the same amount. This affects neither the income statement nor the statement of cash flows of the standard financial accounts. The output is not yet sold. The activity is still in progress. However, we decided to adopt an alternative approach by treating the total output from harvest as if it were sold for cash and subtract work-in-process inventory at that time.[9] For the portion of the

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[9] Under conventional corporate accounting, this practice is allowed if there exists a competitive market for the product.

output that was not actually sold, we treat it as if the household used cash to repurchase the output from the market, at the market price, and added it to finished-goods inventory. There are three advantages to this approach. First, we can track the inputs and outputs of each crop-plot. Second, the value of the finished-goods inventory under this approach is closer to the current market value because it is the contemporary value at the time of harvest. Finally, we can distinguish the net profit from production activity itself from the capital gain from inventory storage, as anticipated earlier. That is, we define storage as another production activity, separated from crop cultivation. The way we treat crop storage activity is also consistent to that of a retail shop holding goods-for-resale inventory.

To continue with our example, suppose the market price of rice is $1 per kilogram at the time of the harvest (the fourth period), and all of the harvest is actually sold. Then there is a revenue of $500 and a net income of $500 – $120 = $380. In the statement of cash flows, this $380 net income enters as a cash inflow. The $120 decrease in work-in-process inventory is also entered as a cash inflow. Both inflows are under the production activity in the statement of cash flows. On the net, the statement of cash flows shows an increase in cash of $380 + $120 = $500, which is exactly the cash the household receives from selling the 500-kilogram rice in the market.

However, if the household actually sells only 400 kilograms of rice and keeps the remaining 100 kilograms in its inventory, we act as if the household used cash to repurchase the 100 kilograms of rice from the market (after selling 500 kilograms to the market) and put it in storage. Finished-goods inventory then increases by $100, and is entered as a cash outflow in the statement of cash flows. In sum, during this period the household balance sheet records (1) a decrease of work-in-process inventory by $120, (2) an (actual) increase in cash by $500 – $100 = $400, and (3) an increase in finished-goods inventory by $100. These lead to a total increase of total assets: –$120 + $400 + $100 = $380. This increase is in turn exactly equal to an increase in household wealth from its savings out of the net income recorded in the income statement, which records (1) a revenue of $500 and (2) a cost of $120. Finally, the statement of cash flows shows (1) a cash inflow

under work-in-process inventory of $120, (2) a cash inflow under net income of $380, and (3) a cash outflow under finished-goods inventory of $100. Therefore, there is a net cash inflow of $120 + $380 − $100 = $400, which is identical to the increase in cash recorded in the balance sheet described above.

In the fifth period, the household consumes 20 kilograms and sells the remaining 80 kilograms to the market. Suppose that the sale is in cash and the market price of rice increases to $1.50 per kilogram. On the income statement, there is the revenue of ($20 + $80) · $1.50 = $150, and the cost of the output sold is ($20 + $80) · $1 = $100, assuming there are no other costs of production.[10] Note that the cost is calculated using the price of $1 per kilogram, which was the price at the time of the harvest, or the input cost of the storage activity. The household earns a net income of $150 − $100 = $50. Note that this income is from crop storage activity, as opposed to the net income from crop cultivation earned and recorded in the fourth period. At the same time, the consumption of $20 · $1.50 = $30 is recorded as a cash outflow. The asset side of the balance sheet shows an increase in cash of $80 · $1.50 = $120, and a decrease of $100 in finished-goods inventory; therefore, the household's total assets increase by $20. This is identical to the increase in household's wealth on the other side of the balance sheet due to its savings, i.e. the household's net income in excess of consumption, $50 − $30 = $20.

4.4.3. Multi-Period Production: Merchandising Retail Business

For the non-agricultural, merchandising retail business households such as local convenience stores, keeping track of the in-transactions and out-transactions of business inventory is very difficult, if not impossible. This is mainly due to the heterogeneous types of this inventory and a large number of transactions daily (and hence monthly). These problems could exacerbate measurement errors if we

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[10] Here the cost of output sold is the cost of finished-goods inventory, which is $1 per kilogram. We treat consumption of household inventory as the consumption of household-produced items as described later in section 4.6. In this case the production technology is the storage technology.

adopt the transaction-based questionnaire described above. De Mel, McKenzie and Woodruff (2009) suggest that it is better to ask for the revenues and the average markups of sales over input costs to adjust for timing mismatch. With this information we can compute the gains and losses between acquisition and sale. By coincidence, this is essentially the method we use in the Townsend Thai Monthly Survey when we compute profits from a household's non-agricultural business. The difference is that the Townsend Thai Monthly Survey did not asked for the markups directly. We compute, however, the markups from the total revenue from sales over the past three months, divided by the total cost of input inventory over the same period. This calculation implicitly assumes that the average number of days that goods are in inventory is less than three months.[11]

Although we advocate the use of markups over detailed questions for non-agricultural retail business, we believe that a detailed questionnaire is extremely useful for the activities that involve relatively homogenous inventory or for inventory that can be easily tracked such as crops and livestock, as we discussed in section 4.4.2.

4.5. OUTPUTS FROM ONE PRODUCTION ACTIVITY AS INPUTS IN OTHERS

A household is typically engaged in many production activities. Many households use outputs produced from one production activity as inputs in other production activities. We treat this transaction as if the household sold the outputs from one activity (in a market), and then repurchased the same commodity at the same value (from the same market) as the inputs for the other activities. For example, a household may raise chickens and use their eggs as an input for food sold in its restaurant. If the net income from the second activity is realized in the same period, there is no change in both total household net

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[11] The Townsend Thai Monthly Survey did not ask explicitly the markups of household's retail business enterprises. Getting better estimate of the markups is one of the possible improvements that we discuss in chapter 7.

income and total cash flow from production because the revenue from one activity is completely offset by the cost from the other activity.

However, the net income of the second activity may not be realized in the same period. For example, a household may use manure from livestock as fertilizer in crop production. For the income statement, the effect is nontrivial. We act as if the household sold the manure and therefore record the transaction in the current period income statement. The repurchase of the manure will not enter the income statement until the harvest period of the crop. There is no change in the total cash flow from production because there was no cash involved in these household transactions, or technically because the cash inflow from manure is offset by the cash outflow for the increase in inventory held by the household, both in the statement of cash flows. Finally, in the balance sheet, this transaction is recorded simultaneously as an increase in household cumulative savings (income without consumption) and an increase in work-in-process inventory.

4.6. CONSUMPTION OF HOUSEHOLD-PRODUCED OUTPUTS AND OTHER CONSUMPTION EXPENDITURES

It is common for agricultural households to consume crops grown on their plots or animals raised on their farms. At a smaller scale, households usually grow vegetables in the backyard. As already noted, in the household financial statements, the consumption of household-produced outputs is recorded under both consumption and production activities as if the household produced and sold the product to the market, and then repurchased and consumed it. Thus output produced and eaten is treated both as income and consumption. Households also catch and consume fish, gather and consume herbs, and gather wood to produce charcoal. All of these are entered as income from other production activities as well as (food or non-food) consumption.

Households may purchase goods (such as rice) in large amounts, put them in inventory, and gradually consume them over time. As before, we view storage as another type of multi-period production

technology, though in this case it is storage of purchased goods. When a household consumes goods from inventory, we treat the transaction as if the household sold the goods in a market and simultaneously repurchased them back as consumption goods, and we record the transaction in the income statement. If the value of the goods at the time of the consumption is the same as the value at the time of the purchase, then the net income (from storage) is zero. If the values are not the same, the difference will be reflected as a capital gain or loss. Note that purchasing goods and putting them in inventory in the earlier month is considered a cash outflow, as reflected by an increase in inventory during the month of the purchase. However, consuming out of inventory does not affect the total cash flow from production during the month of the consumption. This is because net profit (from capital gain and loss), decrease in inventory, and consumption of household-produced (stored) items completely cancel out.

Many consumption items do not require unusual treatment. Many purchases within a month are equivalent with their uses. Examples of these expenses are purchases of perishable items and utility payments. Ideally consumption items distinguish value and quantity, so as to measure prices. Questions are asked about each item individually, at a fine level of disaggregation, depending on the survey. This disaggregation allows us to categorize food versus non-food items, and durable goods such as clothing versus non-durable commodities.[12]

Some items such as gasoline, electricity, and other utility bills are easy to record as expenditures but raise obvious issues. They could be considered as household consumption expenses or cost of production in household production activities like cultivation or business. With limited information in the Townsend Thai Monthly Survey, we treat all of these expenses as non-food consumption expenditure in this monograph. However, the accounting framework provides us with guidelines for improvement should further information be asked in the survey. We could then apportion these expenses and allocate them accordingly to household consumption expenditure or to appropriate production activity as its cost of production.

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[12] Recall that usually there is also a separate module for household fixed assets.

4.7. IN-KIND TRANSACTIONS

Non-cash transactions are not included in the standard statement of cash flows for a corporate firm since they do not change cash holdings. These non-cash transactions are then reported in a separate note schedule.[13] In our framework, however, we decide to include both cash and non-cash transactions with outside entities in the statement of cash flows. We do this for several reasons. First, barter exchanges are common in developing economies. Frequent barter in rice is like commodity money. Other in-kind transactions such as in-kind loans and gifts are also observed. As we are interested in the overall financing of household budget, including both cash and in-kind transactions in the budget analysis seems essential. Dropping non-cash transactions would imply that we discard some useful information from our analysis. For example, if household consumption were entirely from gifts (maybe from relatives), the standard statement of cash flows would show both consumption and gifts of this household as zeros whereas in some sense both are positive. The problem is similar when the household uses inputs (such as fertilizer) acquired as gifts (say, from the government). Second, the assumption of liquidity as reflected by cash alone is not entirely appropriate for households in developing countries. The ability to use commodities as a medium of exchange may help households mitigate the problem of a cash-only budget constraint.[14]

With these reasons in mind, we treat all outside-household transactions in the standard household budget equation as if they were in cash. In the case that a transaction is not cash-related, we view the transaction as a combination of two cash-equivalent transactions. For example, if a household consumes rice borrowed from its neighbor, we will act as if the household borrowed cash from its neighbor and used that cash to purchase the rice. In effect, there is a cash outflow for consumption and, simultaneously, there is a cash inflow from borrowing. Therefore, despite changes in the entries in the statement of

[13] See Stickney and Weil (2002) p. 183.

[14] In practice, it is a judgment call as to which objects are commonly accepted and liquid enough to be used as medium of exchange. Lim and Townsend (1998) provide discussion on this issue.

cash flows, there is no real change in the bottom line – the cash held by the household is unaltered.[15]

4.8. DEPRECIATION OF FIXED ASSETS

The common approach used for depreciation in corporate financial accounting is the straight-line method. Under this method, depreciation is deducted equally (in value) over time until the value of assets becomes zero. Applying this method to a large household survey is extremely complicated because it requires a separate account to trace the current value of *each* asset of each household in each period. To incorporate depreciation into our accounts, we decided to use a constant depreciation rate method instead. This method is relatively simple to implement in the household data. Specifically, one can assume a constant depreciation rate for a given category of assets, and then use it to compute depreciation value (in dollars) based on the value of the assets in the previous period. For the Townsend Thai Monthly Survey, we arbitrarily assume a 10% annual depreciation of fixed assets other than land.

As for the account entries, depreciation is simultaneously deducted from the assets and cumulative savings in the balance sheet, i.e. it is treated as an expense in the income statement. As discussed earlier, depreciation does not involve any actual cash (or in-kind) flow out of the household so we add depreciation back, as a cash inflow, when we adjust the net income to get the cash flow from production in the statement of cash flows.

4.9. LIVESTOCK

Livestock raises a unique issue. In some cases, household revenues are from selling the outputs produced by the animals (such as chicken eggs or cow milk), and in other cases revenues are from selling the

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[15] Again, although the net change in cash is zero, the change in cash flows from consumption and investment, and the change in cash flows from financing are non-zero. They do exactly cancel each other out.

animals themselves (such as chickens or cows). To address this issue, we consider the animals as one type of household assets and distinguish between the two different incomes generated by the livestock. For example, when a household sells milk, we treat the transaction as revenue from livestock activity. Likewise, spending on animal feed and vaccine is recorded as a cost of livestock activity. However, if the household sells the cows, alive or dead, we consider the income as capital gain (or loss, if the sale price is lower than the purchase price) to livestock assets.

Related, as we consider livestock as an asset, we depreciate the livestock as they age. The depreciation rate is computed from the average life expectancy of the animal and is different for different types of animals, based on field experience and conversations with the villagers. For example, in this monograph we assume that a mature cow depreciates at a constant rate of 1% per month, or approximately 12% per year. This rate implies that an average mature cow lives for approximately 8 years. When an animal dies prematurely, we treat it as capital loss. When a new animal is born or when a young animal becomes mature, we considered them as capital gain within the total livestock asset category.

4.10. LOAN PAYMENTS, PRINCIPAL REPAYMENTS, AND INTEREST PAYMENTS

Unlike formal credits with financial institutions, much of the lending and borrowing in developing countries is informal. Although household surveys usually ask detailed questions about repayment of loans, it is sometimes impossible to distinguish between the interest payment and the principal repayment as the compositions of the periodic payments of these loans. For example, a household may know just how much it has to repay the lender in a particular period and for how many periods, but the household does not know which portion of the payment is the interest and which portion is the principal repayment.

To our knowledge, there is no obvious way to deal with this problem. An alternative is that, for each loan, one could compute the total

payment over the loan life and use it to infer the effective interest rate charged on the principal. This method allows a researcher to construct an amortization schedule for each loan, decomposing the periodic payments into interest payments and principal repayments. However, this method poses a problem for loans that have not yet reached maturity so we cannot compute the total payment. Instead, we follow another method and assume that all of the payments go to principal repayment first. Once the principal has been fully paid, the remainder is treated as interest payment. The obvious drawback of this approach is that the interest payments will not enter the statement of income until the principal is fully repaid, making it lumpy. Note that the way we decompose the periodic loan payments also affects the net income and the cash flow from production because the interest payments are recorded period-by-period as interest expense (for the borrowers) or interest revenues (for the lenders). In sum, we should be very cautious when we analyze households with interest revenues or expenses if these accounts form a large part of net income and cash flow.

Finally, our treatment of interests and principal repayments acts as if loans were simple debt, not state-contingent securities. In practice the principal of a loan may be adjusted if the borrower is suffering from adverse events. In some data the lender gets repaid more if the lender is suffering from adverse events (Udry 1994). These contingencies are unfortunately not clearly enumerated before hand, and it is difficult to distinguish lower or higher total repayment due to adverse events on the part of the borrower or lender from interest rates which seem to vary over by loan and time. Nevertheless our method for treating interest expense category captures in part the premium (a higher than typical rate for the lender with adverse shocks) and the indemnity (a lower than typical rate for a borrower having difficulties) that flows from implicit insurance arrangements.

4.11. EXAMPLES

We discussed our conceptual framework on households as corporate firms in chapter 2, background on household surveys in chapter 3, and

Table 4.1. *Examples of Transactions and Their Records*

Transaction	Example of Corresponding Survey Questions	Balance Sheet	Income Statement	Statement of Cash Flows	Remarks
Receive wage income in cash	**JM4D** What is the total amount of cash payments that you received since the last interview for doing this job? Include the value of any cash tips, bonuses or overtime payments. If no cash payments were received, record 0.	Increase in cash; Increase in cumulative savings	Revenue from labor	Net income (Cash inflow)	
Use cash to pay telephone bill	**XM1A [6]** Since the last interview, have you or members of your household made any cash purchases of [telephone and telecommunication services]? If yes, what is the total amount that you and members of your household have spent on [telephone and telecommunication services] since the last interview?	Decrease in cash; Decrease in cumulative savings	Consumption	Consumption (Cash outflow)	
Deposit cash with the production credit group	**SM3B** How much have you deposited to [the production credit group] in total since the last interview?	Decrease in cash; Increase in deposits at financial institutions		Increase in deposits at financial institutions (Cash outflow)	

(continued)

Table 4.1. (*continued*)

Transaction	Example of Corresponding Survey Questions	Balance Sheet	Income Statement	Statement of Cash Flows	Remarks
Sell calves for cash	**IM7C** What is the value of [the baby cows] you got rid of in this transaction? **IM7E** What kind of transaction was this? (1=sell live animal for cash or credit) **IM7F** How much cash did you receive in total for this livestock? (If no cash was received, record 0)	Increase in cash, decrease in livestock assets; Increase in cumulative savings	Capital gain from livestock	Net income (Cash inflow); Decrease in livestock assets (Cash inflow)	1. We consider milk cows as livestock assets similar to fixed assets. 2. Increase in cumulative savings = Capital gain from livestock 3. Total cash inflows = Total cash revenue
Lose value of mature milk cows due to their depreciation (from getting older)	*See last column of this row*	Decrease in livestock assets; Decrease in cumulative savings	Livestock depreciation	(Negative) net income (Cash outflow); Depreciation (Cash inflow)	1. We assume a constant depreciation rate, computed from the fact that a regular mature milk cow lives for about 8 years 2. No net change in cash holding

Lose mature cows due to their death	**IM7C** What is the value of [the mature cows] you got rid of in this transaction? **IM7E** What kind of transaction was this? (13=animal died and was not eaten/sold/etc.)	Decrease in livestock assets; Decrease in cumulative savings	Capital loss from livestock	(Negative) net income (Cash outflow); Decrease in livestock assets (Cash inflow)	No net change in cash holding
Cash purchase of chemical fertilizer for rice plot	**CM5Q** How much cash did you pay in total to acquire [chemical fertilizer]? (If no cash was used, record 0)	Decrease in cash; Increase in input inventory		Increase in input inventory (Cash outflow)	
Use of chemical fertilizer on rice plot	**CFO4F1** What is the approximate total cash value of [chemical fertilizer] you used on this crop-plot since the last interview?	Decrease in input inventory; Increase in work-in-process inventory		Decrease in input inventory (Cash inflow); Increase in work-in-process inventory (Cash outflow)	1. No net change in cash holding 2. No net change in total inventory
Harvest rice and put in inventory	**CFO10E** What is the total value of [rice] that you have harvested since the last interview? *Enumerator: Be sure to include this product in the Inventory of Storable Crop Module.*	Decrease in work-in-process inventory; Increase in finished-goods inventory, increase in cumulative savings	Revenue and cost from cultivation	Net income, decrease in work-in-process inventory (Cash inflow); Increase in finished-goods inventory (Cash outflow)	1. No net change in cash holding 2. No net change in total inventory

Table 4.1. (*continued*)

Transaction	Example of Corresponding Survey Questions	Balance Sheet	Income Statement	Statement of Cash Flows	Remarks
Consume rice from household's inventory	**MM4A1** Since the last interview, have you or members of your household eaten any of [rice stored in inventory]? **MM4A2** If so, how many kilos did you eat?	Decrease in inventory; Decrease in cumulative savings	Capital gain, consumption	Capital gain, decrease in inventory (Cash inflow); Consumption (Cash outflow)	1. For capital loss, transaction is recorded as cash outflow 2. No net change in cash holding
Use rice to feed household's chickens	**MM4B1** Since the last interview, have you or members of your household fed any of [rice stored in inventory] to livestock? **MM4B2** If so, how many kilos did you feed to livestock?	Decrease in finished-goods inventory; Increase in work-in-process inventory		Decrease in finished-goods inventory (Cash inflow); Increase in work-in-process inventory (Cash outflow)	1. No net change in cash holding 2. No net change in total inventory
Purchase animal feed on credit from suppliers	**VM3P** How did you acquire this [animal feed]? **VM3S** If acquired other than through purchase, what is the approximate total cash value of the [animal feed] you acquired?	Increase in inventory; Increase in account payables		Increase in inventory (Cash outflow); Increase in account payables (Cash inflow)	No net change in cash holding

Resell animal feed on credit	**LF3E** Which of the following describes this loan? (E=sold goods on credit) **LF3J** What is the total value of [the animal feed that you sold on credit]?	Decrease in inventory; increase in account receivables; Increase in cumulative savings	Revenue and cost from business activity	Net income (Cash inflow); Decrease in inventory (Cash inflow); increase in account receivables (Cash outflow)	No net change in cash holding
Receive cash repayment for credit sales of animal feed	**LM6B** What is the total amount of repayment that you received on [credit sales of animal feed]? **LM6H** How much of the total amount repaid since the last interview was principal? **LM6I** How much of the total amount repaid since the last interview was interest? *Enumerator: If the borrower has made an "extra payment" please include that amount here.*	Increase in cash; Decrease in account receivables, increase in cumulative savings	Interest revenue	Net income (Cash inflow); Decrease in account receivables (Cash inflow)	Net income = interest revenue
Receive cash as gifts	**GM4C** Since the last interview, how much have you received in total from this type of organization? **GM5C** Since the last interview, how much have you received in total for this type of event?	Increase in cash; Increase in cumulative gifts received		Gift (Cash inflow)	

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Table 4.1. (*continued*)

Transaction	Example of Corresponding Survey Questions	Balance Sheet	Income Statement	Statement of Cash Flows	Remarks
	GM6A3 (GM6B3) [Besides the gifts and contributions from organizations and those that are related to specific events that we have already talked about,] what is the total value of the gifts or remittances that you or members of your household have received since the last interview from people in (outside) the village?				
Receive rice as gifts	**MM3E1** Since the last interview have you or members of your household received any of [rice] as a gift? **MM3E2** If so, how many kilos did you receive as a gift?	Increase in finished-goods inventory; Increase in cumulative gifts received		Increase in finished-goods inventory (Cash outflow); Gift (Cash inflow)	No net change in cash holding

Use of charcoal made from wood gathered from nature	**XM1C [3]** Since the last interview, have you or members of your household [produced and consumed (i.e. not purchased) wood and charcoal]? If yes, what is the total value of the home produced [wood and charcoal] that you and members of your household have consumed since the last interview?	Other revenue; Consumption	Net income (Cash inflow); Consumption (Cash outflow)	No net change in cash holding

Remarks: Examples of corresponding questions are based on the Townsend Thai Monthly Survey. The code in front of each question indicates the number of the question referred.

how to construct financial statements from household surveys earlier in this chapter. Finally, in this section we select some transactions commonly made by households in developing economies and show how to record them in the household financial statements. The examples are shown in Table 4.1. The first column describes the transaction. The second column shows an example of the questions in survey questionnaires associated with the transaction. These questions are taken from Townsend Thai Monthly Survey. The third, fourth, and fifth columns show the corresponding entries on the balance sheet, income statement, and statement of cash flows, respectively. The last column contains remarks crucial to understanding the entries of the transaction to various accounts.[16]

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[16] The detailed algorithm in constructing household financial statements for those surveyed in the Townsend Thai Monthly Survey is presented in Pawasuttipaisit, Paweenawat, Samphantharak and Townsend (2009).

Household Finance

Financial Analysis

Part III of the monograph illustrates how we use the accounts in an analysis of household finance. We demonstrate two different, but complementary, approaches. In chapter 5, we conduct a simple financial analysis of two illustrative case study households selected from the Townsend Thai Monthly Survey. In chapter 6, we apply regression analysis to the entire sampled households in the survey and study liquidity constraints and the financing of household investment.

The case study approach is commonly used by corporate financial analysts and creditors, as one wants to know how well, or how poorly, a given firm or household is doing. The findings from the case study method are likely to be specific and may not be general so in this chapter we supplement each finding from these two households with the quartiles from their corresponding provinces. These quartiles not only allow us to make comparative statements of the case study households relative to others in the same region, but also give us important summaries of key statistics in the Townsend Thai data.

The chapter proceeds as follows. Section 5.1 describes the two households that we picked as our case studies. It also discusses the financial accounts we constructed for these two households. With these accounts in hand, we move on to financial analysis of household behavior. Section 5.2 applies the standard financial ratios and rates of return to analyze the productivity of the households. These exercises give us a simple way to understand some crucial aspects of household performance and the actual household financial situation. We discuss the issues regarding human capital and risk premium that affect the

estimates of the rates of return. We then move to section 5.3, looking
at risks, liquidity, and insurance of household consumption and invest-
ment. We also analyze how different measures of household income,
namely cash flow versus accrued net income, can lead to different
results and conclusions. Section 5.4 goes deeper into actual mecha-
nisms and illustrates how to use the constructed accounts to look at
various devices that the households use to finance their consumption
and investment deficits. Section 5.5 discusses household portfolio
management by analyzing the co-movements of the components of
household assets and liabilities over time as the household accumu-
lates or decumulates wealth. Finally, section 5.6 concludes with a
summary of what we learned from these two case study households
and supplementary statistics from their provinces.

5.1. TWO CASE STUDIES

As discussed in chapter 3, the Townsend Thai Monthly Survey is
being conducted in rural and semi-urban areas of Thailand. An
intensive monthly survey was initiated in 1998 in 16 villages, four
villages in each of the four provinces. There are approximately 45
sampled households in each village. This monthly survey began with
an initial village-wide census. Every structure and every household
was enumerated and the defined "household" units were created
based on sleeping and eating patterns so that all individuals, house-
holds, and residential structures in each of the 16 villages can be
identified in subsequent, monthly responses. The survey itself began
in August 1998 with a baseline interview on the initial conditions of
sampled households. The monthly updates started in September 1998
and track inputs, outputs, and the changing conditions of the same
households over time. As an example, in the appendix we report on
financial statements using months 5–16, one year in length but begin-
ning deliberately with a lag of 5 months from the start of the survey,
after logistics and methods had stabilized. The analysis presented in
this chapter is based on 48 months, the entire sample at the time of
the initial writing of this chapter, again starting from month 5. The

48 months are from January 1999 through December 2002. This 48-month period also coincides with the calendar years, allowing us to compare our results with and make use of the macroeconomic data provided by other sources.

We selected two distinct types of households as our leading, proto-typical examples. The first household, household A, is from Lopburi province in the relatively well-developed central region of Thailand. This household itself is relatively rich. It is composed of four members: a couple and their two daughters. The husband and wife have secondary and primary school education, respectively. The daughters are in school at the time of the survey. The main occupations of the household are trading animal feed and raising milk cows. These businesses are run primarily by the wife. The husband works as a government employee and gets paid monthly, but he also helps his wife run the household businesses. The household is involved in several types of financial contracts: trade credits with suppliers and customers, formal deposits at commercial banks, direct lending and borrowing, and participation in informal rotating savings and credit associations (ROSCA). We knew this a priori, before creating the accounts, which is a reason for the selection of this household as one of our case studies.

The second household, household B, is from Sisaket province in the relatively less developed northeastern region of the country. This household is relatively poor. There are five people in this household: a husband, a wife, a daughter, a son-in-law, and a baby grandson. The husband and the wife have four years of primary education while each of the younger couple has six years of education. All of the household members (except for the baby) work primarily as unpaid workers in the household's rice cultivation. The household is also involved in several other secondary activities, ranging from tapioca growing to fish farming to occasional labor provision. Household members also grow vegetables and raise chickens for household consumption. Inventory plays a prominent role in this household's activities. The household has financial contracts with a production credit group (a village-level savings and loan association), as well as with other households. The household receives transfers and remittances from both the government and individuals, and also provides gifts to other people.

As noted, the Townsend Thai Monthly Survey does not ask in the baseline instrument for the value of cash or jewelry held in the household. However, all subsequent monthly transactions distinguish cash from in-kind transactions, and so cash flow can be accounted for. If we begin with an arbitrary initial guessed value for cash, e.g. zero, then we can see if the net cumulative outflow exceeds this initial guess, indicating the guess was too low. In this way we create an initial lower bound for cash holdings.[1] We also assume a 10% annual depreciation of fixed assets other than land and depreciate livestock at the rate of 1% per month, or approximately 12% per year, compounded. Finally, for agricultural production, we do not distinguish between the farm-gate price and the marketplace price. We can distinguish whether goods are sold in the village or outside the village, but unfortunately the questionnaire is unclear on whether the market price is inclusive of transport costs. In the appendix we present the financial statements for households A and B during months 5–16 as an example.

As can be seen from the balance sheet, household A holds cash, inventory and fixed assets, specifically milk cows, land, and household assets. This is consistent with the fact that the household's main productive activities are livestock and a retail store. The remainder of assets consists of deposits at financial institutions and account receivables from trade credit. Liabilities consist of borrowing from other households and account payables to suppliers. The debt to asset ratio increases over time during the 48-month period, from 20% to 55%. Average total assets over the 48 months are 9.57 million Thai baht (THB).[2]

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[1] With our current guesses on the initial cash holding, cash accounts for 34.8% of the total assets of household A and 30.8% for household B. Also, although the survey does not ask explicit questions about jewelry and gold, the transactions regarding these items are recorded as "Other Expenditure" and "Other Income." However, these transactions are extremely infrequent for all households in the sample. In fact, there were none at all during this 48-month period for the two households.

[2] The exchange rate had fluctuated around 36–45 THB per US dollar over the 48-month period of the data used in this chapter (January 1999–December 2002). The exchange rate was approximately 36–37 THB per US dollar at the starting point of our data in January 1999. Given this fluctuation, we report in this monograph only the values in local currency.

Out of this value, household wealth accounts for 4.96 million THB. Both total asset and total wealth grow over time during this period, although total assets increase at a faster rate than total wealth, as reflected in the increase over time in the debt to asset ratio.

On average, the primary source of revenue for this household is the trading of animal feed (75%), recorded under business revenue.[3] Other revenue comes from milk cows (16%), recorded under livestock revenue, and from labor supply (4%). The household also grows hay, used as livestock feed. Primary expenses are associated with the purchase of animal feed, which the household resells. Aging cattle are explicitly treated as a depreciation expense. Capital gains associated with the birth of calves and their maturation are also explicitly included. Capital losses are associated with premature death of an animal, at the current value, hence net of depreciation. Average total net income is 80,405 THB per month. Given that the average monthly income of households in Thailand in 1999 is 12,729 THB,[4] household A is a relatively high-income household. The average savings rate out of net income is high (67%), compared to the national average of 30–35%. Cash flow for household A is different from accrued income, due primarily to changes in the animal feed inventory, changes in account

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[3]   As discussed earlier in chapter 4, one of the additional assumptions imposed on the Townsend Thai Monthly Survey involves the inventory of goods for resale where we do not know the exact value of the total cost of goods actually sold in a particular period. For example, a retail shop may purchase and sell various goods that the survey did not ask item-by-item in detail. In this case, we usually know only the total expenses of its purchases and the total revenues from its sales in a given period. However, some items may not be sold within the same period in which they were purchased. Likewise, a shop may purchase the same physical commodity in various periods with different prices so it is difficult to determine the cost of goods sold without imposing relatively complicated last-in, first-out or first-in, first-out (LIFO or FIFO) inventory methods. To deal with this problem in a less complicated way, we compute the cost of goods sold in each period as distinct from the total revenues, where the markup is computed as a ratio between total revenues of goods sold during the last three months divided by total expenses of goods purchased during the last three months. The implicit assumption is that goods for resale are sold within three months.

[4]   This information is from the Household Socio-Economic Survey (SES) conducted by Thailand's National Statistical Office.

receivables (trade credits), and depreciation. Again, we deliberately picked this household, a relatively rich household with small and medium business enterprises, to illustrate the potential complexity of the accounts.

Household B, the relatively poor household, has average assets and average wealth of 86,044 THB and 81,730 THB, respectively. Its primary assets consist of cash and inventories. The only liabilities are loans from other households. Revenue comes from infrequent wages (36%) and cultivation of rice (31%). Costs of rice cultivation are high but also infrequent. The average total net income is 1,835 THB per month, making it a relatively poor household as compared to the national average. Savings, as computed from net income in excess of consumption, appear to be negative in some months, but the overall average saving rate over the 48 months is approximately positive at 45%. The difference between cash income and accrual income comes from rice inventory.

5.2. PRODUCTIVITY

We study household productivity by applying the standard corporate financial ratios and rates of return to the two case study households. Although we need a more thorough analysis to understand household behavior, these financial ratios provide us with simple but revealing statistics that illustrate the productivity and the underlying financial situations of the households. We start with two conventional measures of productivity (and their components): the rate of return on assets, and the rate of return on wealth (or equity). It is clear that the distinction between household assets and household wealth that we discussed earlier in this monograph becomes crucial. Then, we discuss how the simple conventional rates of return computed from our household financial statements could be biased due to the omission of human capital, or may not reflect the underlying productivity of the household due to the difference in risk premia of the production technology of the household. We propose possible remedies to mitigate these drawbacks accordingly.

5.2.1. Return on Assets

The rate of return on total assets (ROA) measures a household's performance in using assets (real and financial) to generate earnings from all sources. ROA is a typical measure of performance used in the corporate finance literature. As we indicated earlier, we do restrict attention in this monograph to the return on overall production activities. This avoids the problem of estimating the rate of return to various activities separately. More specifically, we do not need to allocate assets and labor to activities. The overall return is the return to owner-utilized resources, such as land and labor. In principle we could impute a rental on the use of owned land in agriculture. That would enter as a cost in agriculture, hence lower net income from agriculture, but would simultaneously enter by same amount as household rental income. Thus total net income does not change and we do not need to impute a rental value to compute the rate of return on total assets. A similar argument applies to other household owner utilized assets and to the labor of household members in family production activities.[5]

We also emphasize that ROA is the return on assets and not the return on equity or wealth. That is, ROA is independent of the financing of those assets. Therefore, the income used in computing the rate of return on assets is the income before payments or distributions to the providers of funds, including interest payments. As we will see below, this can make a difference for households with high levels of indebtedness. Specifically, ROA is the net income plus interest payments, divided by the average total assets during that period. We use accrual income here, not cash flow, as the goal is to measure performance (returns generated from assets) and not to measure liquidity problems. Average total assets are measured as a simple average of total assets at the beginning and at the end of the period.

$$\text{ROA} = \frac{\text{Net Income} + \text{Interest Payment}}{\text{Average Total Assets}}$$

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[5] However, this imputation is needed if we wish to compute rates of return to particular activities.

Table 5.1. *Monthly Average of Annualized Rates of Return on Assets (ROA),
Annualized Rate of Return on Wealth (ROE) and Their Components*

	Household A [1st, 2nd, 3rd Province Quartiles]	Household B [1st, 2nd, 3rd Province Quartiles]
Rate of Return on Assets (ROA), %	12.93% [15.32, 22.37, 32.11]	49.95% [14.63, 23.17, 32.02]
Profit Margin Ratio for ROA	21.13% [−90.25, 30.87, 61.29]	52.22% [−42.02, 28.29, 59.34]
Asset Turnover Ratio	0.39 [0.28, 0.38, 0.48]	0.59 [0.22, 0.33, 0.46]
Rate of Return on Wealth (ROE), %	15.95% [18.24, 25.23, 37.05]	52.85% [17.96, 27.25, 44.76]
Profit Margin Ratio for ROE	21.10% [−144.87, 25.81, 58.71]	52.22% [−90.74, 8.54, 51.73]
Asset Turnover Ratio	0.39 [0.28, 0.38, 0.48]	0.59 [0.22, 0.33, 0.46]
Asset to Wealth Ratio	1.81 [1.04, 1.13, 1.29]	1.07 [1.09, 1.20, 1.41]
Debt to Wealth Ratio	*0.81* *[0.04, 0.14, 0.28]*	*0.07* *[0.09, 0.20, 0.42]*

Remarks: Monthly averages are computed over 48 months, from January 1999 to December 2002. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province.

   Based on the information from the income statements and the balance sheets of households A and B, Table 5.1 displays the uncompounded, annualized monthly average ROA of households A and B, as well as the province quartiles from Lopburi and Sisaket. We see that the ROA of household A at 13% is considerably lower than the ROA of household B at 50%. This comes from a combination of two aspects of the data. First, household A seems to be less productive relative to its Lopburi counterparts. Its ROA of 13% is lower than the 15% of the first quartile in that province. Second, household B seems to be more productive relative to its Sisaket counterparts. Its ROA of 50% is higher than the third quartile ROA in that province, 32%.

   The rate of return on assets can be disaggregated into the product of two ratios, namely the profit margin ratio for ROA and the total asset turnover ratio. The profit margin ratio measures the household's

income relative to its revenues, thus implying the costs of revenue-generating production. The asset turnover ratio measures the ability of household assets to generate revenue. More specifically, these are the first and second terms of the following decomposition:

$$\text{ROA} = \frac{\text{Net Income + Interest Payment}}{\text{Revenues}} \cdot \frac{\text{Revenues}}{\text{Average Total Assets}}$$

The disaggregation reveals that the high earnings per asset of household B come from a combination of two aspects: a relatively high profit margin, higher than the median, and a very high asset turnover ratio, higher than the upper quartile in the province. Household A has a median asset turnover ratio but a relatively low profit margin. Microfinance literature is familiar with the ideas though they are not often quantified so systematically. A household vendor has to purchase inventory and may sell these goods relatively quickly, leading to low assets and a high turnover ratio. If the household is constrained in credit markets, it may have a high profit margin but be unable to exploit this because it is unable to expand the business with inventory financed by credits. For our two case study households, this stereotypical picture more resembles household B.

There is some month-to-month variability in ROA. As shown in Table 5.2, the coefficient of variation for household A is 0.87 and for household B is 1.75. The same relative orders of magnitude prevail in the provincial numbers. In other words, the cross-sectional distribution of coefficients of variation is lower in Lopburi than in Sisaket. These are related to measures of risk and variability presented later in this chapter. The ROA of both households are fluctuating less than their provincial average, each having a coefficient of variation less than the first quartile of its own province. Note that Sisaket has relatively more debt and also has higher variability, so in that sense it is not true that household debt is more limited for households with more volatile returns, the ones with higher coefficient of variation of ROA.

Alternatively, we compute the long-run ROA as total net income over 48 months divided by average total assets over the 48-month period, representing the rate of return over the four complete years

Table 5.2. *Comparison of the Average of Short-Run Returns and the Returns over Long-Run Period*

Household A [1st, 2nd, 3rd Province Quartiles]	Household B [1st, 2nd, 3rd Province Quartiles]
Panel I: Short-Run ROA	
Mean	
12.93% [15.32, 22.37, 32.11]	49.95% [14.63, 23.17, 32.02]
Coefficient of Variation	
0.87 [0.97, 1.61, 2.36]	1.75 [1.88, 2.37, 3.00]
Panel II: Long-Run ROA	
9.36% [14.77, 21.15, 30.13]	41.10% [13.84, 21.19, 28.48]

Remarks: Short-run ROA is computed as monthly net income plus interest expense divided by average total assets during the particular month. The mean of short-run ROA is the arithmetic average of monthly ROAs over 48 months. The coefficient of variation of short-run ROA is the standard deviation of monthly ROA, divided by the mean monthly ROA. *Long-run ROA* is computed as total net income over 48 months plus interest expense over 48 months divided by average total assets over the 48-month period. The 48 months are from January 1999 through December 2002. All of the returns are annualized, but not compounded. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province.

of the data used. As shown in Table 5.2, the alternatively computed long-run ROA seems to be lower than the short-run average for both households, but the overall ranking of each household relative to its provincial counterparts remains the same as before.

Finally we note that if we had used cash flow as a measure of income in computing ROA, that measure would fluctuate more and be less informative of true underlying productivity. This will be evident in section 5.3.1 where we discuss and compare the variability of net income versus cash flow.[6]

[6] We also note that in recent economic literature, e.g., Hsieh and Klenow (2007), Restuccia and Rogerson (2008) and others, return on physical assets is proportional with implicit or explicit taxes or subsidies that distort capital costs or reflect political economy as well as credit market distortions. As profits are normalized by capital, total factor productivity and talent do not enter into ROA, at least under the market structures and Cobb-Douglas production functions assumed in much of this literature. However, as in the Lloyd-Ellis and Bernhardt (2000) model, talent can re-appear in income/asset ratios if it lowers setup costs. Here we are engaged in

5.2.2. Return on Household Wealth

Analogous to the rate of return on equity (ROE) for corporate firms, the rate of return on household wealth measures a performance of a household in using *its own wealth* in generating income, again from all activities.[7] Specifically, ROE for a household is computed as the net income divided by the average total wealth of the household over the period. The difference between the rate of return on total assets and the rate of return on household wealth is that the rate of return on household wealth also takes into account the sources of household's financing; therefore, the net income used in the calculation of ROE is net of interest payments to outsiders.

$$ROE = \frac{\text{Net Income}}{\text{Average Wealth}}$$

As can be seen from Table 5.1, for both households, the return on wealth is higher than the return on assets. That is, for household A the annualized average ROE is 16% versus the ROA of 13%, a relatively big differences, and for household B the ROE of 53% versus the ROA of 50%. Note that both the rate of return on assets and the rate of return on wealth are higher for household B, the relatively poor household. There are also other relatively poor households in the data with high rates of return.

A household's rate of return on total assets is equal to the weighted average of the return to debt-financed assets and the return to household-owned assets. In contrast a household's return on wealth or equity is the return on net worth only. Thus results in Table 5.1 with ROE higher than ROA imply that the returns to debt holders (or the cost of debt) are relatively low for both households. In fact, we can see from the income statements that the interest expenses of these two

a fact-finding mission, and our main interest in this chapter is in illustrating the uses of our constructed financial accounts. Thus we compute the conventional ROA as well as the ROA with household labor and risk adjustments without linking much to structural specifications of production functions or market equilibrium.

[7] To keep the analogy, we adopt ROE as the acronym for the rate of return on household wealth, i.e. household's equity.

households are very low. The average interest expense to borrowing for these households is less than 1% over the 48 periods.[8] Therefore, it would seem that the households should, in principle, borrow more until the interest rate (the cost of debt financing) goes up or the returns on assets and wealth go down, so that the rate of return on assets is equal to both the rate of return to debt holder and the rate of return on household wealth. One possible explanation is that household members, as the residual claimants, bear more risks than the debt holders and are compensated with higher returns. Another possible explanation is that the access to credit is limited for these households.

The rate of return on household wealth can be disaggregated into the products of the profit margin ratio for ROE, the total asset turnover ratio, and the leverage ratio.[9]

$$ROE = \frac{\text{Net Income}}{\text{Revenue}} \quad \frac{\text{Revenue}}{\text{Average Total Assets}} \quad \frac{\text{Average Total Assets}}{\text{Average Household's Wealth}}$$

Indeed, the contributions to ROE of profit margin ratios and asset turnover ratios are quite similar to those for ROA, but the average debt-to-wealth ratios over the 48 months at 0.81 for household A and only 0.07 for household B explain why ROE for household A differs more from ROA than for household B. The ratios tell that a larger fraction of household A's assets is financed by debt as compared to household B's, for whom almost all assets are owned by the household and are not financed by debt. This finding, together with the fact that the rate of return on total assets of household B is larger than that of household A, suggests that household B may have more difficulty in getting loans from creditors or for unknown reasons is less willing to borrow. Note that household A has a high debt-to-wealth ratio

[8] The lending rates from commercial banks in Thailand were about 11.25–12.50% in 1999. The interest rate for savings deposits at commercial banks was at 5% at the beginning of 1999, decreased to 2.5% at the end of the year, and remained relatively low through the end of 2002.

[9] As household asset is identical to the sum of household debt and household wealth, the last component can be written as 1+ debt-to-wealth ratio.

compared to other households in Lopburi while household B has a small debt-to-wealth ratio relative to other households in Sisaket. Also note that the debt-to-wealth ratios for both households are very small in comparison with the debt-to-equity ratios for corporate firms in Thailand. This is even more striking when we take into account the fact that the debt-to-wealth ratios for households A and B are likely to be overestimated due to the underestimation of the household wealth.[10]

5.2.3. Omission of Human Capital and the Bias in Rates of Return

As mentioned earlier, total assets and total wealth in our constructed household balance sheet do not include human capital and other intangible assets. As a result, the conventional rate of return on assets and rate of return on wealth overestimate the return to tangible capital. Net income in the numerator of the rate of return includes the compensation to human capital and other intangibles in addition to tangible (physical and financial) assets and wealth, but human capital and other intangible capital are not in the denominator. Since we cannot value the stock of human capital and other intangibles of the household with reasonable accuracy, it is very difficult, if not impossible, to compute the true denominator of the ratio, and hence the rate of return to household total (tangible-plus-intangible) assets. However, we can adjust the conventional rate of return on assets and calculate a less biased rate of return to household tangible assets instead. This rate of return measures the ability of the household to use its tangible assets to generate income.

In order to calculate the rate of return on tangible assets, we subtract the counterfactual return to wage earnings, including both the return to human capital in the labor market and the return to labor supplied to household production activities, from the total net income (plus interest expenses) in the nominator. This correction procedure is not trivial, however. Although we do observe labor wages in periods

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[10] The average debt-to-equity ratio of the publicly-traded firms in Thailand in 1999 was 1.33.

when a household member works in external labor markets, we do not observe counterfactual wages when a household member only works on home activities. We briefly discuss our procedure here.[11]

The procedure is relatively straightforward for a household member who earns labor income from the labor markets in virtually every month. In this case, we can use the observed the wage rate for each of such household members. Together with the survey data on time spent on home production activities, we can then calculate the shadow compensation the household member would have received, the cost of providing labor to production, both for the household's own farming or other business activities.

The procedure becomes more complicated when the household members do not work in the labor market every month and we observe their monthly market wage rate only in some months but not others. In this case, we interpolate the shadow wage rate of each member based on the member's own observed market wages, taking into consideration seasonal and cyclical fluctuations in wage rate in the village. The fluctuations are inferred from the calendar month and year fixed effects in the panel regressions of all individuals earning wages sampled in each village.

The most complicated procedure involves household members who never work in the external labor market throughout the sample period. In this case, we impute the member's shadow wage rate from individual characteristics (gender, education attainment, and age), together with calendar month and year fixed effects. Again, this shadow wage rates are estimated from a panel regressions of all individuals sampled in each village. Biases from self-selection into household activities versus external labor market are addressed and corrected by the Heckman two-step procedure.

The first row of Table 5.3 shows the average or expected rates of return on tangible assets of households A and B. After subtracting compensation to household labor supply from the conventional ROA,

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[11] For more detailed discussion on wage imputation of the Townsend Thai Monthly Survey, see Townsend and Yamada (2008). Note that the assumptions on wage imputation could be modified, but the overall procedure of the computation of the rate of return on tangible assets remains the same.

Table 5.3. *Average Returns on Tangible Assets, Tangible Asset Beta, and Tangible Asset Alpha*

	Household A [1st, 2nd, 3rd Province Quartiles]	Household B [1st, 2nd, 3rd Province Quartiles]
Expected Return on Tangible Assets	0.97 [1.19, 4.07, 8.30]	6.87 [0.23, 1.31, 4.34]
Tangible Asset Beta	−0.007	1.31
Tangible Asset Alpha	1.02 [−0.25, 0.77, 3.76]	6.24 [−0.04, 1.18, 4.11]

Remarks: Expected return on tangible assets is monthly average of return on household tangible assets, which in turn is computed as an average monthly net income plus interest expense minus compensation to household labor divided by average total tangible assets. *Tangible asset beta* is the covariance of household's monthly return on tangible assets and monthly village return divided by variance of monthly village return. *Tangible asset alpha* is the difference between expected return on tangible assets and the product between asset beta and expected village return on tangible assets. The 48 months are from January 1999 through December 2002. All of the returns are annualized, but not compounded. Household A's province quartiles are computed from 146 households in Lopburi province. Household B's province quartiles are computed from 137 households in Sisaket province. (Note that households with income completely from labor provision are not included in the computation of province quartiles in this table, resulting in the smaller numbers of households in the provinces than those in Table 5.2.)

the rates of return to tangible assets drops dramatically from 13% to about 1% for household A, and from 50% to 7% for household B. Household A's return is lower than household B's. Similar to the order of the conventional estimate of ROA, household A's return is below the lower quartile of Lopburi while household B's return is much higher than the upper quartile of Sisaket. In general, however, the return to tangible assets in Sisaket is now lower than Lopburi.

5.2.4. Risk Premium versus Productivity

The rates of return on assets and equity are usually used as a measure of performance or productivity of the firm or of the household enterprise. The ROA and ROE however do not take into account that higher expected returns could compensate for the higher risks in certain production activities. In order to compare household productivity in the cross section, we need to compute a risk-adjusted return, i.e. the return not driven by the riskiness of the production technology. At first blush one might try to control for idiosyncratic risk, but as discussed in more detail in Samphantharak and Townsend (2009),

the Capital Asset Pricing Model (CAPM) of the finance literature provides us with a more appropriate guideline to think about the measurement and the price of risks.[12]

In general, CAPM stipulates that, with complete markets, only the aggregate, non-diversifiable risks are priced while idiosyncratic risks are diversified away across households. Specifically, CAPM implies that the expected return in excess of the risk-free rate is proportional to the risk of the asset. The risk of the assets is measured by the co-movement of the excess return of the asset and the market excess return, where the asset's excess return is the difference between the asset return and the return on risk-free assets, and the excess market return is the difference between the market return and the return on risk-free assets. Specifically, this risk is computed as the covariance of the excess return on household assets and the market (village) excess return, normalized by the variance of the market return. In fact, this is equivalent to the slope coefficient of a simple regression with the asset's excess return as the dependent variable and the market excess return as the explanatory variable. This risk is therefore known in the finance literature as the asset beta, as individual returns are influences by co-movement with the market. Empirically, this is shown in equation (5.1) below.

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i \left(r_{m,t} - r_{f,t} \right) + \varepsilon_{i,t}, \tag{5.1}$$

where $r_{i,t}$ is asset i's return in period t; $r_{m,t}$ is the market return in period t; and $r_{f,t}$ is the return on risk-free asset in period t. The CAPM gives us the null hypothesis that the constant α_i for each asset is zero, and only the risk, or the asset beta, determines the excess return of the asset. That is, under the null hypothesis, equation (5.1) also implies that the expected excess return of asset i is determined only by its beta and the expected market excess return.

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[12] Based on Markowitz's (1952) mean-variance utility, Lintner (1965) and Sharpe (1964) developed the traditional CAPM. Later, consumption-based CAPM was pioneered by Breeden (1979), Lucas (1978), and Rubinstein (1976), among others. See Cochrane (2001) for a unified approach of asset pricing theories.

In reality, the α_i's are not necessarily zero as there are several factors that make the excess return of the asset higher than what is predicted by the conventional CAPM. Jensen (1967) proposes that α_i could be interpreted as the abnormal return of the asset. In fact, financial practitioners use Jensen's alpha as a measure of performance of an asset (or a fund manager). We follow this tradition, thinking of α_i as a measure of how well the household i manages its assets in generating income. We compute the alpha of household i, and then use it as our measure of risk-adjusted rate of return.

Specifically, we start with the monthly rate of return on tangible assets discussed earlier. Next, we compute the asset beta for each household using the village as the market. We assume that the return on the risk-free asset is zero in our sample so an asset's excess return is identical to asset return itself.[13] We then compute the risk premium for each household, defined as the product of the household beta and the village's expected return. Finally, we compute the household's alpha by subtracting the risk premium of the household from the expected return of the household's tangible assets.[14]

The second row of Table 5.3 shows the asset beta's for household A and household B. Household A has a negative, but very close to zero, beta, implying that its tangible asset return does not move much with the village return. In fact, it moves slightly in the opposite direction from the village return, i.e. it works like insurance. Household B, on the contrary, has a beta greater than one, which means that its return on tangible assets moves in the same direction as the village return but with higher fluctuation.

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[13] We make this assumption based on the fact that most of the households in our sample hold large amount of cash, which has zero nominal return. Although in principle we should use the real returns in the analysis, the returns used in this chapter are in nominal term. The main reason is for simplicity and due to the lack of reliable price index in the villages at the time of writing this monograph. Given the high frequency of the data and the relatively low inflation in Thailand during the period, this simplified analysis should not be associated with large biases in the estimates.

[14] Expected return is computed as the time-series arithmetic average of the monthly returns.

Finally, the last row of Table 5.3 reports the asset alpha for both households and their provincial quartile counterparts. Household A has a risk-adjusted return as measured by its alpha of about 1% annually. Note that although this household has lower conventional ROA and lower return on assets than the lower quartile of Lopburi province, its risk-adjusted return is above the provincial median. The explanation is that many households in Lopburi engage in more risky production activities (as measured by their beta) and their higher returns are simply compensation for this higher risk (as captured by their risk premium). On the other hand, household B has a beta greater than one, i.e. it bears more risk than the village average and in principle is compensated for this higher risk. We saw previously that household B's return on asset is in the top quartile of Sisaket province, even when we adjusted for labor income. Here, even adjusting further for higher risk that this household generates with its assets, its risk-adjusted return on tangible assets remains higher than most of the households in Sisaket.

5.3. LIQUIDITY AND INSURANCE

In addition to productivity, short-term liquidity management is another important issue for households in developing countries. For example, Paxson (1993) studies seasonal consumption smoothing in Thailand. Duflo, Kremer and Robinson (2009) include the possibility that fertilizer use within a crop season in Kenya is constrained by liquidity. For our two case study households, we can see from the household financial statements in the appendix that household net income, consumption, and investment fluctuate over time. In this section, we take the financial statements of the two case study households to an analysis of liquidity and insurance of consumption and investment. We look at three aspects of liquidity constraint, smoothing, and insurance: (1) fluctuations of net income, cash flow, consumption, and investment; (2) co-movements of consumption, investment, cash flow, and net income, and (3) a regression analysis of consumption and investment onto cash flow and net income. Note that, unlike the

earlier analysis of the rates of return on assets and wealth, the analysis in this section is not subject to a bias from not including measured human capital in the balance sheet.

5.3.1. Fluctuation of Net Income, Cash Flow, Consumption, and Investment

We start with a simple descriptive statistic that captures the information on fluctuation of household net income, cash flow from production, consumption, and investment. This information is from the statements of cash flows of households A and B. Table 5.4 shows the coefficients of variation of these variables for households A and B and the corresponding province quartiles. Consumption is broken down to consumption of household-produced outputs and consumption expenditure on goods produced outside the household. Investment or capital expenditure is defined as expenditure in fixed assets, gross of depreciation, over a period of time. The variability of income and risk

Table 5.4. *Coefficients of Variation of Monthly Cash Flow, Net Income, Consumption, and Investment*

Variable	Household A [1st, 2nd, 3rd Province Quartiles]	Household B [1st, 2nd, 3rd Province Quartiles]
Cash Flow	2.98 [1.22, 2.25, 4.07]	2.88 [3.10, 4.01, 6.96]
Net Income	0.87 [0.91, 1.46, 2.25]	1.81 [1.86, 2.30, 2.95]
Consumption	0.65 [0.53, 0.91, 1.39]	0.46 [0.56, 0.94, 1.76]
Consumption of Household-Produced Outputs	*0.30 [0.30, 0.38, 0.48]*	*0.60 [0.51, 0.62, 0.69]*
Consumption Expenditure	*0.66 [0.56, 1.02, 1.60]*	*0.64 [0.88, 1.53, 2.75]*
Capital Expenditure	4.78 [3.63, 5.71, 10.35]	–

Remarks: Cash flow is the household's cash flow from production. *Net income* is the accrued net income of the household. *Consumption of Household-Produced Outputs* is consumption of the products produced by the household. *Consumption expenditure* is broadly defined as the consumption of products not produced by the household that must be acquired from outside the household. *Capital expenditure* is the household's investment on fixed assets, gross of depreciation. Capital expenditure of household B was very small and very infrequent and therefore dropped from the study. The coefficient of variation is the standard deviation, dividing by the mean over 48 months, from January 1999 through December 2002. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province.

in the underlying environment is evident in many key variables. We emphasize first that cash flow for each household has a much higher coefficient of variation than does accrued net income, specifically 2.98 versus 0.87 for household A and 2.88 versus 1.81 for household B. This is consistent with the guess that motivated the distinction and construction of the accounts from the outset. Relative to the province, household B has a relatively low variation of cash flow, while household A is closer to the median. Both households have relatively low coefficients of variation of net income. More generally, Sisaket appears to be a riskier environment than Lopburi, consistent with the ordering of A versus B.

Consumption variability is in turn lower than the variability of net income, evidence of consumption smoothing. Consumption variability remains higher in Sisaket than in Lopburi, but now the ordering of households A and B is reversed, higher for household A in Lopburi at 0.65 than for household B in Sisaket at 0.46. One might infer that household B is smoothing better than its provincial counterparts. It is interesting to note that the variability of consumption is coming more from the purchased goods (i.e. the expenditure component) than from the consumption of household-produced goods. This is true for both households A and B point-wise and for the distributions within each province. Finally, capital expenditure is the most variable item, with a coefficient of variation of 4.78 for household A, more or less typical for Lopburi province. The explanation is that gross investment is lumpy in amount and sporadic in timing. We return to this in the application in chapter 6.

5.3.2. Co-movement of Consumption, Investment, Net Income, and Cash Flow

Next we look at another simple descriptive statistic that captures the pair-wise co-movements between consumption, investment, net income, and cash flow from production. Table 5.5 shows that the correlations between cash flow and net income are high at 0.82 and 0.78 for households A and B. However, both households are around the upper quartile of their province distribution; more generally, the correlations between cash flow and net income are not that high, with a median of 0.65 for Lopburi and only 0.37 for Sisaket.

Table 5.5. *Correlation Coefficients between Cash Flow, Net Income, Consumption, and Investment of the Two Case Study Households*

	Cash Flow	Net Income	Total Consumption	Consumption of Household-Produced Outputs	Consumption Expenditure
Panel A: Household A [1st, 2nd, 3rd Province Quartiles]					
Net Income	0.82***				
	[0.40, 0.65, 0.89]				
Consumption	0.55***	0.53***			
	[−0.06, −0.00, 0.15]	[−0.06, 0.02, 0.17]			
Consumption of Household-Produced Outputs	0.05	0.11	−0.08		
	[−0.10, −0.00, 0.13]	[−0.09, 0.02, 0.14]	[0.04, 0.24, 0.47]		
Consumption Expenditure	0.56***	0.53***	1.00	−0.09	
	[−0.06, 0.01, 0.14]	[−0.06, 0.03, 0.17]	[1.00, 1.00, 1.00]	[−0.02, 0.18, 0.08]	
Capital Expenditure	−0.05	−0.12	−0.03	0.04	−0.03
	[−0.31, −0.05, 0.07]	[−0.52, −0.08, 0.01]	[−0.06, 0.01, 0.09]	[−0.06, 0.02, 0.14]	[−0.07, −0.00, 0.08]
Panel B: Household B [1st, 2nd, 3rd Province Quartiles]					
Net Income	0.78***				
	[0.11, 0.37, 0.71]				
Consumption	0.13	0.40***			
	[−0.05, 0.03, 0.16]	[−0.10, −0.00, 0.13]			
Consumption of Household-Produced Outputs	−0.13	0.10	0.73***		
	[−0.12, −0.02, 0.13]	[−0.06, 0.03, 0.16]	[0.29, 0.53, 0.73]		
Consumption Expenditure	0.32**	0.49***	0.76***	0.10	
	[−0.05, 0.04, 0.21]	[−0.03, 0.09, 0.27]	[0.87, 0.96, 0.99]	[−0.02, 0.16, 0.38]	

Remarks: Cash flow is the household's cash flow from production. *Net income* is the accrued net income of the household. *Consumption of Household-Produced Outputs* is consumption of the products produced by the household. *Consumption expenditure* is broadly defined as the consumption of the product not produced by the household and must be acquired from outside the household. *Capital expenditure* is the household's investment on fixed assets, gross of depreciation. Capital expenditure of household B was very small and very infrequent and therefore dropped from the study. Correlation is computed over 48 months, from January 1999 through December 2002. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province. * is statistically significant at 10%; ** is statistically significant at 5%; and *** is statistically significant at 1%.

It may appear that the distinction between cash flow and net income is muted for the two case study households in question, but the difference reappears in the consideration of consumption. The correlations of these two measures of income with consumption are higher for household A (0.56 and 0.53 for cash flow and net income, respectively) than household B (0.32 and 0.49). For household B, at least, consumption expenditure is more correlated with net income than with cash flow. Still, for household A, the two numbers are similar, with cash flow correlation slightly higher point-wise. If anything, these patterns are reverse in the provincial cross sections, with households in Lopburi have slightly higher correlations of consumption with accrued income and the reverse in Sisaket. Yet cash flow does remain an important consideration for consumption expenditure on purchased items for both of these households, though household B may be smoothing cash flow fluctuations better. Again, compared with other households in Lopburi and Sisaket, the correlation coefficients of households A and B are relatively large. Finally, for household B, consumption of household-produced items remains a larger percentage of the budget and co-moves much more with total consumption. Consumption of household-produced items is correlated neither with cash flow nor net income for either household. Capital expenditures for household A are point-wise negatively related to contemporaneous consumption and contemporaneous income, though not statistically significant. In the larger cross section, correlations of investment with contemporaneous consumption and contemporaneous income are negative for up to half of the households, particularly so for accrued income.[15]

5.3.3. Regression Analysis of Consumption, Investment, Net Income, and Cash Flow

We now turn to conventional measures of variability using the available monthly data. We continue to include and distinguish both the

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[15] In chapter 6, however, we show that household investment is positively correlated with future ROA, which is computed from net income. Altogether, the findings are consistent with the idea that households are forward looking and that investment takes more than one month before its proceeds are realized.

Table 5.6. *Simple Regressions of Monthly Consumption and Investment on Cash Flow and Net Income*

Dep. Var.	Consumption Expenditure			Capital Expenditure		
Panel A: Household A						
Cash Flow	0.111***		0.072*	−0.063		0.210
	(0.025)		(0.044)	(0.197)		(0.346)
Net Income		0.132***	0.059		−0.196	−0.409
		(0.031)	(0.054)		(0.241)	(0.428)
Intercept	22.489***	15.273***	18.965***	25.237	38.820	49.581
(×10³)	(2.186)	(3.225)	(3.880)	(17.261)	(24.907)	(30.737)
Adj. R²	0.289	0.265	0.292	−0.019	−0.007	−0.021
No. of Obs.	48	48	48	48	48	48
Panel B: Household B						
Cash Flow	0.054**		−0.020			
	(0.023)		(0.033)			
Net Income		0.056***	0.067***			
		(0.015)	(0.023)			
Intercept	0.886***	0.790***	0.785***			
(×10³)	(0.090)	(0.090)	(0.091)			
Adj. R²	0.089	0.221	0.210			
No. of Obs.	48	48	48			

Remarks: Cash flow is the household's cash flow from production. *Net income* is the accrued net income of the household. *Consumption expenditure* is broadly defined as the consumption of the product not produced by the household and must be acquired from outside the household. *Capital expenditure* is the household's investment on fixed assets, gross of depreciation. Capital expenditure of household B was very small and very infrequent and therefore dropped from the study. The unit of observations is household-month, covering 48 months, from January 1999 through December 2002 for each household. Standard errors are in parentheses. * is statistically significant at 10%; ** is statistically significant at 5%; and *** is statistically significant at 1%.

cash flow and accrued net income concepts. The idea is to see if household behavior has an interpretation that is consistent with the differences between these two concepts. As shown in Table 5.6, standard consumption regressions are consistent with the earlier tables of variability and correlation. For each household, consumption expenditures are regressed onto cash flow in one specification, onto net income in another, and onto both in the third specification. Household A shows some sensitivity of consumption expenditures to both measures of income, particularly so for cash flow when both variables are included

in the regression jointly. Household B also shows some (smaller) sensitivity to both measures of income, but perhaps more so to net income than cash flow, when both are included. This finding reinforces the idea that household B is insuring itself reasonable well.[16] Note, though, that capital expenditure for household A do not appear sensitive to cash flow even when we control for profitability as captured by net income.[17]

5.4. FINANCING AND LIQUIDITY MANAGEMENT

We have learned from section 5.3 that the households (partially) smooth their consumption and investment deficits. It is natural that we study how they do so and quantify the use of the financing devices, both internal (such as cash and savings) and external (such as debts and gifts). We explore this issue in this section by looking at variance decomposition. Because we are interested in the financing mechanisms and devices that are used to finance cash flow deficits, we restrict our attention in this section to the cash flow measure of income. We address the management of wealth (equity) accumulation in turn, in the next section.

The tool we use to analyze deficit financing is variance decomposition. The decomposition examines if deficits co-move with each financing device. We look at the household budget identity from the statement of cash flows, as shown in equation (2.1) and the discussion shortly thereafter. Let

$$D \equiv F_1 + F_2 + \cdots + F_n,$$

where D is the deficit and F_i is a particular financing device. Therefore, subtract the means from the left and right hand sides,

$$D_t - \bar{D} \equiv [F_{1,t} - \bar{F}_1] + [F_{2,t} - \bar{F}_2] + \cdots + [F_{n,t} - \bar{F}_n]$$

---

[16] However, another interpretation is that household A consumes items with higher income elasticity.

[17] We present more analysis of investment–cash flow sensitivity in chapter 6.

which implies

$$\sum_t [D_t - \bar{D}]^2 \equiv \sum_t [F_{1,t} - \bar{F}][D_t - \bar{D}] + \sum_t [F_{2,t} - \bar{F}][D_t - \bar{D}]$$
$$+ \cdots + \sum_t [F_{n,t} - \bar{F}][D_t - \bar{D}]$$

$$\mathrm{Var}(D) \equiv \mathrm{Cov}(D, F_1) + \mathrm{Cov}(D, F_2) + \cdots + \mathrm{Cov}(D, F_n).$$

Finally, we have

$$1 \equiv \frac{\mathrm{Cov}(D, F_1)}{\mathrm{Var}(D)} + \frac{\mathrm{Cov}(D, F_2)}{\mathrm{Var}(D)} + \cdots + \frac{\mathrm{Cov}(D, F_n)}{\mathrm{Var}(D)} \tag{5.2}$$

In other words, we decompose the variation in the deficit into its components, where each component is the co-movement between the deficit and a particular financing device. The variables are constructed in such a way that the covariance terms should be positive if the component is contributing to smoothing, i.e. an increased deficit is associated with more borrowing, the running down of savings accounts, and so on. Note also from equation (5.2) that the covariances between the deficit and the devices, normalized by the variance of the deficit, sum to one. Therefore, the normalized covariance is in this sense a measure of how much the device accounts for the variation in the deficit.[18] Finally, we can do this decomposition for any measures of deficit as from equation (2.1), namely $C + I - Y$, or each component separately, a consumption deficit $C - Y$, which may be financed in part by asset sales, and an investment deficit $I - Y$, which could be financed in part by drops in consumption.

Table 5.7 shows that the relatively rich household A almost exclusively finances the cash budget deficit (surplus) with reductions (increases) of cash holding. This is true of many other households in Lopburi, but household A is exceptional in terms of the order of magnitude, which is higher than the third quartile of the provincial cross section. Other contributions to financing deficits, including reduction

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[18] This approach is similar to Asdrubali, Sorrensen and Yosha (1996). Note that each component is also a coefficient from the simple regression of F_i on D.

Table 5.7. *Variance Decomposition of Consumption and Investment Deficits*

Cov(D,F)	Definition of Deficit			
	Household A [1st, 2nd, 3rd Province Quartiles]			Household B [1st, 2nd, 3rd Province Quartiles]
Var(D)	$C+I-Y$	$C-Y$	$I-Y$	$C-Y$
Decrease in Deposit at Financial Institution	0.75 [−0.14, 0.05, 2.31]	0.82 [−0.12, 0.08, 3.02]	0.70 [−0.02, 0.12, 2.91]	0.19 [−0.19, 0.01, 0.33]
Decrease in Net ROSCA Position	0.27 [0.00, 0.00, 0.00]	0.94 [0.00, 0.00, 0.00]	0.28 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Lending	−0.05 [0.00, 0.00, 0.00]	−0.10 [0.00, 0.00, 0.00]	−0.05 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Borrowing	0.58 [−0.02, 3.47, 13.94]	2.87 [−0.82, 1.82, 13.74]	0.75 [−0.10, 3.28, 13.70]	8.84 [−0.16, 2.72, 14.51]
Net Gifts Received	−2.05 [−0.08, 1.48, 12.17]	−7.01 [−0.48, 1.11, 12.19]	−2.34 [−0.25, 0.88, 6.73]	13.00 [0.11, 8.27, 24.55]
Decrease in Cash Holding	100.49 [64.58, 85.54, 98.92]	109.20 [71.22, 95.76, 117.61]	96.54 [64.89, 84.82, 98.52]	77.97 [49.94, 78.84, 93.99]
Decrease in Fixed Assets	–	−6.72 [−20.31, −3.88, 1.16]	–	–
(Negative) Consumption Expenditure	–	–	4.12 [−0.95, 0.37, 3.19]	–
Total	**100**	**100**	**100**	**100**

Remarks: The numbers are in percentage. Regarding the definitions of deficits, "C" denotes consumption expenditure, i.e. consumption of outputs not produced by the household that must be acquired from outside household; "I" denotes capital expenditure, gross of depreciation; and "Y" denotes cash flow from production. Capital expenditure of household B was very small and very infrequent and therefore dropped from the study. The numbers are in percentage. The unit of observations is household-month, covering 48 months, from January 1999 through December 2002 for each household. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province.

in deposits at financial institutions, net ROSCA position, and borrowing, are each tiny (less than 1%). Gifts are actually negative, as if received when the household is running a monthly surplus. A possible explanation for the opposite sign of net gifts received and the greater-than-one-hundred-percent contribution from cash is that gifts and cash holding are correlated in a cash management strategy – the household spends cash not only for deficit financing, but also as gift giving to others. We will come back to this issue later. Note that for other households in Lopburi, gifts and borrowing are larger and more frequently positive in sign. Finally, note that to a small degree investment is financed by drops in consumption as might have been anticipated earlier; on the other hand, consumption deficits are not financed by capital disinvestment, i.e. the sign of the covariance is negative.

For the relatively poor household, there is virtually no investment in fixed assets, so we restrict our attention to the consumption deficit $C - Y$. Household B's budget financing picture displays a bit more variety. Cash still predominates with a correlation of 78%, typical of the province. Gifts and borrowing are much larger, entering at 13% and 9%, respectively, larger than the provincial medians, though clearly others in the province are using debt as well. Debt and gifts are used more in Sisaket than Lopburi. In this sense household B is not autarkic but is actively engaged in credit markets. The picture of limited debt as a stock (as household liabilities in the balance sheet) is altered when considering debt as a flow (as financing cash flow deficits in the statement of cash flows).

The numbers could be misleading if the devices are correlated among themselves. The household may find that some devices are close substitutes, raising one while lowering the other, giving a perverse negative sign to items considered individually. Indeed, it is possible that the household may simply be moving assets and liabilities around without any immediate correlation with the contemporary deficit. The correlations among financing devices are easy to compute from the accounts. Specifically, we find that the correlation coefficient between decreases in deposits at financial institutions and borrowing is –0.44 (statistically significant at 1%) for household A. That is, when this

household borrows, it increases its deposits at financial institutions (and/or pays back loans from those deposits). Neither transaction is necessarily related to the current budget deficit. Also, household A tends to borrow less when it receives large amount of gifts, delivering the negative correlation of –0.25 (statistically significant at 10%), whereas if there were a budget deficit in that period, one might imagine both would move together and the correlation would be positive. Finally, when either household receives gifts they tend to keep them in the form of an increase in cash holding, with correlation coefficients of –0.4 for household A and –0.53 for household B (statistically significant at 1% for both households).

These kinds of correlations affect our calculation of variance decomposition. The effect can be analyzed by further decomposing the variance decomposition. Using the fact that $D \equiv F_1 + F_2 + \cdots + F_n$, equation (5.2) implies

$$
\begin{aligned}
1 = {} & \frac{\mathrm{var}(F_1)}{\mathrm{var}(D)} + \frac{\mathrm{cov}(F_1,F_2)}{\mathrm{var}(D)} + \cdots + \frac{\mathrm{cov}(F_1,F_n)}{\mathrm{var}(D)} \\
& + \frac{\mathrm{cov}(F_2,F_1)}{\mathrm{var}(D)} + \frac{\mathrm{var}(F_2)}{\mathrm{var}(D)} + \cdots + \frac{\mathrm{cov}(F_2,F_n)}{\mathrm{var}(D)} \\
& + \cdots \\
& + \frac{\mathrm{cov}(F_n,F_1)}{\mathrm{var}(D)} + \frac{\mathrm{cov}(F_n,F_2)}{\mathrm{var}(D)} + \cdots + \frac{\mathrm{var}(F_n)}{\mathrm{var}(D)}
\end{aligned}
\tag{5.3}
$$

Table 5.8 shows an example of this decomposition, for the overall cash deficit, of consumption plus investment. The column on the far right replicates the information from the earlier Table 5.7 (with rounding errors) and the elements in the row, the normalized correlations, sum to the number in the last column. In order to understand the table, let's look at household B's net gifts received as an example. Panel B of the table shows that net gifts received by this household fluctuate with the (normalized) variance of 57%, which is more than the co-movement of gifts and deficit as measured by the (normalized) covariance of 13%, reported in the far right column. The explanation is that most of the fluctuation in gifts comes in the form of a change in cash holding, 43%, rather than being used as deficit financing.

Table 5.8. *Variance Decomposition of Consumption and Investment Deficit*

$\dfrac{\text{Cov}(F_i,F_j)}{\text{Var}(D)}$	Decrease in Deposit at Financial Institution	Decrease in Net ROSCA Position	Lending	Borrowing	Net Gifts Received	Decrease in Cash Holding	$\dfrac{\text{Cov}(D,F_j)}{\text{Var}(D)}$
Panel A: Household A [1st, 2nd, 3rd Province Quartiles]							
Decrease in Deposit at Financial Institution	0.49 [0.02, 1.27, 8.07]	−0.01	0.00	−0.37	0.02	0.62	**0.75**
Decrease in Net ROSCA Position	−0.01 [0, 0, 0]	0.22 [0, 0, 0]	0.00	−0.06	−0.02	0.15	**0.27**
Lending	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00	−0.05	**−0.05**
Borrowing	−0.37 [−0.62, −0.01, 0]	−0.06 [0, 0, 0]	0.00 [0, 0, 0]	1.43 [3.82, 13.62, 38.99]	−0.16	−0.25	**0.58**
Net Gifts Received	0.02 [−0.16, 0, 0.11]	−0.02 [0, 0, 0]	0.00 [0, 0, 0]	−0.16 [−0.16, 0.03, 0.80]	0.29 [0.78, 5.10, 43.22]	−2.18	**−2.05**
Decrease in Cash Holding	0.62 [−2.78, −0.12, 0.05]	0.15 [0, 0, 0]	−0.05 [0, 0, 0]	−0.25 [−24.25, −4.19, 0.06]	−2.18 [−24.80, −3.20, −0.26]	102.20 [87.51, 108.39, 193.89]	**100.49**
Total							**100**

Table 5.8. (*continued*)

Panel B: Household B [1st, 2nd, 3rd Province Quartiles]

$\dfrac{\text{Cov}(F_i,F_j)}{\text{Var}(D)}$	Decrease in Deposit at Financial Institution	Decrease in Net ROSCA Position	Lending	Borrowing	Net Gifts Received	Decrease in Cash Holding	$\dfrac{\text{Cov}(D,F_j)}{\text{Var}(D)}$
Decrease in Deposit at Financial Institution	0.07 [0.02, 0.31, 9.49]	0.00	0.00	0.00	−0.03	0.15	**0.19**
Decrease in Net ROSCA Position	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00	0.00	0.00	**0.00**
Lending	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00	0.00	**0.00**
Borrowing	0.00 [−6.09, −0.08, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	6.13 [9.10, 24.09, 51.67]	−1.11	3.82	**8.84**
Net Gifts Received	−0.03 [−0.05, 0.01, 0.24]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	−1.11 [−1.81, −0.76, 1.28]	56.86 [11.57, 48.69, 160.16]	−42.73	**13.00**
Decrease in Cash Holding	0.15 [−1.44, −0.03, 0.13]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	3.82 [−36.37, −13.27, −2.25]	−42.73 [−127.83, −28.60, −3.42]	116.73 [101.40, 132.98, 251.95]	**77.97**
Total							**100**

Remarks: The numbers are in percentage. Deficit $D \equiv C + I - Y$, where C is consumption expenditure, I is capital expenditure, gross of depreciation, and Y is cash flow from production. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province. Since the matrices are symmetric, we do not report the province quartiles of the above-diagonal elements.

Similarly, for household A, we can see the reason why the decrease in outstanding lending does not help finance the deficits is that it is negatively correlated with the decrease in deposits at financial institutions, i.e. lending to other households and lending to institutions seem to be close substitutes. Borrowing for household A is positively related to deficit movements, as noted, but the small number is due in part to the negative correlation between deposits and borrowing, as anticipated above. We report as well the quartiles for the other households in the province but only note that negative correlations and asset substitutions are commonplace with similar negative signs.

Finally, we remind the reader again that the variance decomposition is based on the level flows of cash from various transactions and not rates of return. Therefore, this analysis is not subject to the underestimate of total assets and wealth due to the omission of human capital or other intangible assets.

5.5. WEALTH MANAGEMENT

In the previous section, we looked at different devices that the households use to finance their cash shortfall, i.e. their cash flow deficits. That is, we study how the households conduct liquidity management. In this section, we turn to another related but different issue: how the households manage their asset and liability composition when they accumulate (or decumulate) wealth from savings out of net income and gifts received. This is analogous to a firm's asset and liability management out of its equity (retained earnings and new equity issues).

The method we use to study household portfolio management is again a variance decomposition, similar to what presented in the previous section. The main difference is that we would like to explain the co-movements of household's wealth accumulation (from retained earnings out of net income plus net gifts received) and changes in the positions of different types of household assets and liabilities (as reflected in the balance sheet).

Unlike the liquidity management analyzed in the previous section, wealth accumulation may be reflected as a change in any type of assets

or liabilities, including trade credit (account receivables and account payables) and inventory. The reason why trade credit and inventory do not appear in the previous section is that changes in trade credit and inventory either have nothing to do with cash flow or are already a part of the cash flow from production. A purchase of inputs with an account payable does not involve cash and need not to be financed by cash. In fact, this transaction is not a part of the cash flow constraint equation. When the account payable is paid, it is already included in the measure of cash flow from production in the cash flow constraint. Similarly, a sale of outputs with an account receivable has not yielded cash payment yet. When the receivable is repaid, it is already included in the measure of cash flow from production in the cash flow constraint.

Changes in inventories deserve special attention. As discussed in chapter 4, we treat changes in inventories as profit (or loss) making activity. Therefore, they are already included as cash flow from production. This is appropriate for the non-buffer stock households. However, since inventories are a part of household assets, changes in inventories are a part of asset management of the household. We emphasize again that the treatment of changes in inventories as cash flow from production is to some extent arbitrary. For buffer stock households, changes in inventories could be treated as cash flow from financing, like the way we treat deposit accounts. In such case, inventory changes would appear both as a financing mechanism of cash flow budget deficit, and as changes in household assets in portfolio management.

Based on the information from the balance sheets of households A and B, Table 5.9 shows remarkably that the portfolio management of changes in equity actually amplifies the use of cash for household A, at 112%, as with an upward shift in the distribution for most of its fellow Lopburi households, and portfolio management attenuates the use of cash for household B, down to 55%, with a down shift in the distribution with its fellow Sisaket households. Inventory change is shown to be an important mechanism for household A at 19%, more than for other Lopburi households. Inventory is also a widely used device for household B for accumulating wealth, second only to cash. Household A makes some small use at approximately 3% for

Table 5.9. *Variance Decomposition of Wealth Accumulation into Changes in Different Types of Assets and Liabilities*

	Household A [1st, 2nd, 3rd Province Quartiles]	Household B [1st, 2nd, 3rd Province Quartiles]
Change in Cash Holding	111.67 [72.66, 95.11, 108.24]	55.09 [4.91, 10.70, 29.50]
Change in Account Receivables	−3.88 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Change in Deposit at Financial Institution	2.59 [−0.19, 0.01, 3.09]	0.12 [−0.17, 0.00, 0.29]
Change in Net ROSCA Position	0.98 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Other Lending	−0.10 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Change in Inventory	18.64 [−6.80, 0.22, 9.04]	35.80 [1.23, 10.70, 29.50]
Change in Livestock Asset	2.63 [−0.07, 0.00, 1.31]	0.05 [−0.80, 0.02, 2.73]
Change in Fixed Asset	−20.30 [−1.47, 0.04, 2.23]	3.21 [−0.09, 0.22, 5.09]
Change in Account Payables	−15.49 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.04]
Other Borrowing	3.26 [−1.73, 8.77, 22.16]	5.74 [−2.67, 0.65, 4.21]
Total	**100**	**100**

Remarks: The numbers are in percentage. The unit of observations is household-month, covering 48 months, from January 1999 through December 2002 for each household. *Wealth accumulation* is defined as the difference between total wealth of the current period and the previous period. Changes in assets and liabilities are defined by accounting identity, and the sum of the changes in all assets and liabilities are identical to the change in total wealth. For example, a *decrease* in wealth corresponds to a *decrease* in cash holding or an *increase* in borrowing. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province.

deposits at financial institutions, with these greater than the median for other households in the province. Household B is using borrowing at 6%, more than most households in the province. Finally, there is a large negative contribution for household A for account receivables and very large negative contribution for fixed capital. Surprisingly, increases in wealth of household A show up in cash much more than in fixed, illiquid assets.

The apparently heavy use of cash in the change in net worth can be explained in part again by an examination of asset substitution and complementarity. These are presented in Table 5.10. For example, for

Table 5.10. *Variance Decomposition of Wealth Accumulation into Changes in Different Types of Assets and Liabilities*

Panel A: Household A [1st, 2nd, 3rd Province Quartiles]

	A	B	C	D	E	F	G	H	I	J	Total
A	461.44 [111, 207, 313]	-12.99	3.22	1.09	-0.23	27.63	-3.26	-313.44	-50.68	-1.11	111.67
B	-12.99 [0, 0, 0]	22.76 [0, 0, 0]	-1.41	-0.22	0.01	1.37	-1.05	-6.78	-5.42	-0.17	-3.88
C	3.22 [-6, 0, 0]	-1.41 [0, 0, 0]	2.26 [0, 2, 15]	-0.07	0.01	0.16	0.68	-2.29	1.75	-1.71	2.59
D	1.09 [0, 0, 0]	-0.22 [0, 0, 0]	-0.07 [0, 0, 0]	1.01 [0, 0, 0]	0.00	0.29	-0.37	0.10	-0.56	-0.30	0.98
E	-0.23 [0, 0, 0]	0.01 [0, 0, 0]	0.01 [0, 0, 0]	0.00 [0, 0, 0]	0.02 [0, 0, 0]	-0.25	-0.01	0.08	0.29	-0.01	-0.10
F	27.63 [-108, -10, 0]	1.37 [0, 0, 0]	0.16 [-1, 0, 0]	0.29 [0, 0, 0]	-0.25 [0, 0, 0]	24.39 [3, 24, 112]	-0.49	-15.60	-19.43	0.58	18.64
G	-3.26 [-5, 0, 0]	-1.05 [0, 0, 0]	0.68 [0, 0, 0]	-0.37 [0, 0, 0]	-0.01 [0, 0, 1]	-0.49 [-1, 0, 0]	3.94 [0, 0, 10]	1.29	2.33	-0.43	2.63
H	-313.44 [-13, -2, 0]	-6.78 [0, 0, 0]	-2.29 [0, 0, 0]	0.10 [0, 0, 0]	0.08 [0, 0, 0]	-15.60 [-8, 0, 0]	1.29 [0, 0, 0]	304.41 [1, 9, 45]	10.51	1.40	-20.30
I	-50.68 [0, 0, 0]	-5.42 [0, 0, 0]	1.75 [0, 0, 0]	-0.56 [0, 0, 0]	0.29 [0, 0, 0]	-19.43 [0, 0, 0]	2.33 [0, 0, 0]	10.51 [0, 0, 0]	47.31 [0, 0, 0]	-1.61	-15.49
J	-1.11 [-39, -5, 0]	-0.17 [0, 0, 0]	-1.71 [0, 0, 0]	-0.30 [0, 0, 0]	-0.01 [0, 0, 0]	0.58 [0, 0, 0]	-0.43 [0, 0, 0]	1.40 [-2, 0, 0]	-1.61 [0, 0, 0]	6.62 [4, 23, 74]	3.26
Total											**100**

A = change in cash holding, B = change in inventory, C = change in account receivables, C = change in deposit at financial institution, D = change in net ROSCA position, E = other lending, F = change in inventory, G = change in livestock asset, H = change in fixed asset, I = change in account payables, J = other borrowing

Remark: See remarks after Panel B.

Panel B: Household B [1st, 2nd, 3rd Province Quartiles]

	A	B	C	D	E	F	G	H	I	J	Total
A	57.54 [87, 119, 149]	0.00	0.07	0.00	0.00	2.51	−2.11	−4.82	0.00	1.88	55.09
B	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C	0.07 [−1, 0, 0]	0.00	0.04 [0, 0, 0]	0.00	0.00	−0.01	0.01	0.01	0.00	0.00	0.12
D	0.00 [0, 0, 0]	0.00	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00 [0, 0, 0]	0.00	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00	0.00	0.00	0.00	0.00
F	2.51 [−35, −12, −2]	0.00	−0.01 [0, 0, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	31.97 [11, 30, 72]	−0.98	1.83	0.00	0.47	35.80
G	−2.11 [−7, −1, 0]	0.00	0.01 [0, 0, 0]	0.00	0.00	−0.98 [−1, 0, 0]	3.14 [1, 3, 12]	−0.09	0.00	0.07	0.05
H	−4.82 [−3, 0, 0]	0.00	0.01 [0, 0, 0]	0.00	0.00	1.83 [0, 0, 1]	−0.09 [0, 0, 0]	5.98 [0, 2, 19]	0.00	0.29	3.21
I	0.00	0.00	0.00	0.00	0.00	0.00	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.00	0.00
J	1.88 [−25, −9, −1]	0.00 [0, 0, 0]	0.00 [−5, 0, 0]	0.00 [0, 0, 0]	0.00 [0, 0, 0]	0.47 [−1, 0, 1]	0.07 [−1, 0, 1]	0.29 [0, 0, 0]	0.00 [0, 0, 0]	3.03 [5, 20, 48]	5.74
Total											**100**

A = change in cash holding, B = change in account receivables, C = change in deposit at financial institution, D = change in net ROSCA position, E = other lending, F = change in inventory, G = change in livestock asset, H = change in fixed asset, I = change in account payables, J = other borrowing

Remarks: The numbers are in percentage. The unit of observations is household-month, covering 48 months, from January 1999 through December 2002 for each household. *Wealth accumulation* is defined as the difference between total wealth of the current period and the previous period. Changes in assets and liabilities are defined by accounting identity, and the sum of the changes in all assets and liabilities are identical to the change in total wealth. For example, a *decrease* in wealth corresponds to a *decrease* in cash holding or an *increase* in borrowing. Household A's province quartiles are computed from 164 households in Lopburi province. Household B's province quartiles are computed from 148 households in Sisaket province.

both households, and especially for household A, there are negative correlations between fixed assets and cash (for each household this is larger than for the rest of the province), and between trade credits (account receivables and payables) and cash.

5.6. CONCLUSION

The results from the two case study households and other households in their corresponding provinces help us better understand the financial situations of households in the Townsend Thai Monthly Survey. There is a relatively large dispersion of the average rates of return on assets across households. Relatively poor households seem to have higher rates of return. For some households, the rate of return on assets can be substantially different from the rate of return on equity or wealth of the household, especially for households with high levels of debt relative to assets. For others, the small difference between returns on assets and wealth would indicate that debt levels are relatively low, likely because either there are credit market imperfections or such households are unwilling to borrow. Return on assets drops dramatically when we subtract off an imputed opportunity cost of household labor. Some households remain with high rates of return. Adjusting further for a risk premium suggested by the CAPM lowers the return of some households relative to their position in the cross-sectional distribution of households in the village if their returns are highly covariate with the village average. Poor households seem to have higher risk-adjusted return than rich households.

Income volatility is high. Cash flow is highly variable, much more so than accrued income. Consumption is smoother however, especially for consumption of household-produced items. There is some evidence of smoothing. Correlations of consumption with either measure of cash or accrued income are less than unity and often low. Some households appear to base their consumption behavior more on accrued net income than cash flow, in the sense that the correlation of

consumption and income is higher for accrued income than for cash flow. Consumption of other households is more sensitive to liquidity in the form of cash flow rather than accrued net income. Investment or capital expenditure of most households is usually either uncorrelated, or negatively correlated, with contemporaneous net income (although we show in the next chapter that capital expenditure is highly correlated with future returns on assets, suggesting that the households in our sample are forward-looking and not myopic). Consumption is negatively correlated with investment for some households, indicating that these households may finance their consumption by selling their assets or finance their investment by reducing their consumption.

In terms of financing, cash is used to finance consumption and investment cash flow deficits. However, there are nontrivial fractions of households that use gifts and borrowing, particularly so in the less developed province. There are also nontrivial financial transactions that appear not directly or at least not immediately related to cash flow budget deficits. For example, for the case study households, borrowing is put on deposit as financial savings; borrowing decreases with incoming gifts; and gifts are held as cash.

For wealth management, increases in the equity of the household are associated with increases in cash in the more developed province, though for the case study households this is due in part to substitutability between cash and other assets in the portfolio and in part to the fact that increases in account payables and fixed assets are negatively correlated with increase in net worth. For those households in the poorer province, change in inventories seems to be a nontrivial part of wealth management.

In summary, the results in this chapter suggest that households in the sample are engaged in nontrivial financial transactions. Their financing, liquidity, and wealth management are often complicated. The financial accounts we construct for these households help us disentangle these complications and present some salient facts, hopefully in a relatively simple but lucid way. We find that some households in our sample seem to have a high rate of return to assets even after adjusting for household labor and risk premium; debts of many households

are low; consumption fluctuates with (either cash or accrued) income; and cash is a main source of financing budget deficits. These findings suggest that these households in our sample may face financial constraints. In order to empirically test this hypothesis, we turn to a more rigorous empirical analysis in the next chapter.

An Application: Liquidity Constraints, Kinship Networks, and the Financing of Household Investment

We showed in chapter 5 how to perform various simple financial analyses from the financial accounts constructed from a household survey. We did so by looking at two distinct households that we chose as our case studies. Although the case study approach gives us a lively story about the financial situations and behavior of these two households, it leaves us with a question whether the results from the case study households can be generalized to other households in the survey. This chapter takes an alternative approach and presents an application of household financial accounts to an analysis of the behavior of rural households from a larger set of the sampled households.

Specifically, we look at liquidity constraints and the financing of household investment in fixed assets. We find that rural households in our sample, especially the poor, seem to face liquidity constraints. These constraints are partially mitigated by kinship networks in the village. When we further analyze gift and borrowing transaction data, we find that the kinship effect for the poor households seems to be through both gifts and borrowings, while the effect for the rich households is more likely to be from gifts and not from borrowing. Using the accounting distinction between the use of a stock of cash and the cash flow, we find that rich households finance investment from previously accumulated cash, i.e. they use internally generated funds, symptomatic of constraints in a pecking order literature. As a result, we argue that although investment–cash flow sensitivity implies

liquidity constraints, the reverse is not guaranteed. Finally, we also find evidence consistent with the fact that the network effect may come in both direct channels (gifts and borrowing from people within village) and indirect channels (signal of quality by being a part of the network).

The application here is appropriate and interesting on several levels. First, the literature in corporate fixed investment has been developed theoretically and applied extensively. We show here how development economics can borrow these theoretical frameworks and empirical strategies from corporate finance and apply them to a study of household behavior. This is of course natural, as we have constructed our household financial accounts with the conceptualization of households as corporate firms. Second, we show how useful the detailed items in household financial accounts are for the analysis of investment financing. Third, we emphasize that high frequency data is very relevant for the study of liquidity constraints. Finally, we show that non-financial information gathered in a household survey, both at the household and the village levels, can be integrated into the analysis of household financing behavior.

Our study in this chapter contributes to the literature in various ways. First, consistent with the existing literature, we find that rural households in our sample seem to face liquidity constraints, which are partially mitigated by kinship networks. Second, as anticipated, we add to existing criticism of the use of investment–cash flow sensitivity analysis as a way to test liquidity constraints.

The chapter is outlined as follows. Section 6.1 discusses the literature on investment and liquidity constraints. Section 6.2 revisits the Townsend Thai Monthly Survey, which we use as our sample, and discusses the construction of the variables. Section 6.3 presents summary statistics of the key variables. Section 6.4 presents the empirical results on investment, liquidity constraints and household wealth. Section 6.5 studies the effects of kinship network on liquidity constraints. Section 6.6 analyzes investment-financing mechanisms using the variance decomposition method. Finally, section 6.7 concludes what we have learned from this application.

6.1. INVESTMENT AND LIQUIDITY CONSTRAINTS

The corporate finance literature on investment and its financing is extensive.[1] Modigliani and Miller (1958) show that, in a world with frictionless, perfect capital markets, capital is allocated efficiently: the marginal revenue product of capital is equated across all projects in the economy. The q-theory approach, proposed by Tobin (1969) and extended by Hayashi (1982), reformulates the neoclassical theory of investment with the implication that, under perfect capital markets, a firm's investment should depend only on its profitability, as measured by its q value. Liquidity of the firm should not affect its investment behavior.

However, in a world with frictions such as information asymmetries or transaction costs, internal and external finance are not perfect substitutes. Using funds from external sources is likely to be more costly than using internal funds such as cash flow from production. For example, Myers and Majluf (1984) and Greenwald, Stiglitz and Weiss (1984) suggest that issuing new equities could be costly to the firm. Stiglitz and Weiss (1981) show that some firms with good investment opportunities cannot get loans to finance their projects.

Studies of the effects of liquidity constraints on investment have been growing since the work by Fazzari, Hubbard and Petersen (1988). Running a regression of a firm's investment on its operating cash flow, controlling for some measures of its future profitability, these studies compare the regression coefficients on the cash flow variable across different types of firms. The common finding is that investment is more sensitive to cash flow for the firms classified a priori (e.g. by size, age, or dividend payout) as likely to be liquidity constrained than for the firms classified as unconstrained. The argument from this investment–cash flow sensitivity study is that the liquidity-constrained firms have to rely more on their own internal funds. Therefore, their investment is more sensitive to the movement

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[1] See Stein (2003) for the extensive survey of corporate investment literature.

of their operating cash flow. Hubbard (1998) offers a survey of the literature in this direction.[2,3]

In the context of this chapter, we are particularly interested in household fixed assets, which need to be acquired and maintained through household investment or capital expenditure. Similar to corporate investment, household fixed investment could be financed internally or externally. Internal funds of the household include cash flow from production and conversion of other assets (stock of cash in hand, deposits at financial institutions, among others) into fixed assets. External finance could be from borrowing and gifts. As we argue earlier in this monograph, many households in developing countries engage in production in both farm and non-farm activities, which require fixed assets as well as other inputs such as labor as their factors of production. Therefore, households face similar investment decisions and constraints as corporate firms. Specifically, we expect a household to invest more if the return on assets is high. At the same time, household investment could be constrained by the liquidity

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[2] Recently, the investment-cash flow approach has been under debate. Kaplan and Zingales (1997 and 2000) argue from theory that firms with higher sensitivity of investment to cash flow empirically are not necessarily the firms with higher degree of credit constraint. In other words, although liquidity constraints imply that the first-order derivative of firm's investment to cash flow is positive, the sign of the cross second-order derivative with respect to the degree of liquidity constraints is ambiguous. Empirically, they recategorize low-dividend firms in Fazzari, Hubbard, and Petersen's sample according to each firm's annual report and management discussion of liquidity. They find that firms that appear to be financially less constrained have higher investment sensitivity to cash flow than the firms that appear to be more constrained. See Kaplan and Zingales (1997 and 2000) and Fazzari, Hubbard and Petersen (2000) for detail. We set aside for future work the issue of whether unconstrained households in our sample are more constrained.

[3] Another approach to directly test for a firm's financial constraints was proposed by Banerjee and Duflo (2008). Their study determines whether firms are credit constrained based on how they react to changes in directed lending programs. The basic idea is that while both constrained and unconstrained firms may be willing to absorb all the directed credit that they can get (because it may be cheaper than other sources of credit), constrained firms will use it to expand production, while unconstrained firms will primarily use it as a substitute for other borrowing.

situation of the household, where the household is forced to rely on its internal funds in financing capital expenditure.

6.2. DATA

The data used in this chapter is from the Townsend Thai Monthly Survey described in detail in chapter 3. The analysis presented in this chapter is based on 84 months, starting from month 5. This is the entire sample at the time of the initial writing of this chapter. The 84 months are from January 1999 through December 2005. The sample includes 531 households in all of the 16 villages of the survey.[4]

6.2.1. Demographic and Kinship Variables

Demographic information is from the questionnaire on household composition. The questions including total number of household members as well as each member's name, gender, relationship to the head of the household, age, and education. An individual is considered to be a member of a particular household if he or she has slept in the house for at least 15 days out of the past 30 days. Information on age, gender, and education are used in the imputation of labor income of each household member as discussed below in this section.

Kinship networks are constructed from the information on close familial relatives that are not a part of the household proper. For each household, the survey asks whether relatives of the household are still alive and live within the village. The relatives solicited in the questionnaire include parents and siblings of household head, parents and siblings of household head's spouse, and sons and daughters of household head. Again, for each of these relatives, the survey also asks whether the person is still alive and where the person is living, i.e. which "building structure" as recorded in the initial village census. With this information, we construct a kinship network map for each village.

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[4] Note that the number of the households included in this chapter is smaller than the total number of households in the survey because we restrict our study to the households that always present in our sample throughout the 84-month period.

Figure 6.1 shows two network maps, one from a village in Chachoengsao province and the other from a village in Sisaket province. The number at each node in the maps represents a structure number of a household in the village. The link between each two nodes implies that the two households are related by kinship. Since we restrict our interest in this chapter to relatives living in the same village, we should view our network maps as an illustration of a *local* kinship group. As can be seen from Figure 6.1, the sample village in Chachoengsao has multiple and less dense local kinship networks, while almost all (although not all) households in the sample village in Sisaket have relatives living locally in the same village from the same extended family. For our empirical analysis, we construct a network dummy variable for each household that takes the value of one if the household belongs to a (any) local kinship network, and equals zero otherwise. We cannot look at each network separately because dense networks in some villages create identification problems in the regressions with village fixed effects. One of the main advantages of this kind of network based on kinship is that it is largely exogenously given for each household. The decision to be in or belong to a network is less subject to self-selection than membership into a joint liability group or a rotating savings and credit association (ROSCA).

6.2.2. Financial Variables

Most of the data used in the empirical analysis of this chapter come from the household financial statements. These statements are constructed using the methods described in the earlier chapters of this monograph. In this section, we will discuss how to use the line items from the financial statements to compute each of the variables used in the empirical analysis of this chapter.

Fixed Assets: In the household financial statements, fixed assets are recorded under the asset side of the balance sheets. The Townsend Thai Monthly Survey classifies fixed assets into four broad categories, namely household fixed assets, agricultural fixed assets, business fixed assets, and land and other fixed assets. Household fixed assets include, among others, living room sofa, television, VCR, air

Panel A: A Village in Chacheongsao
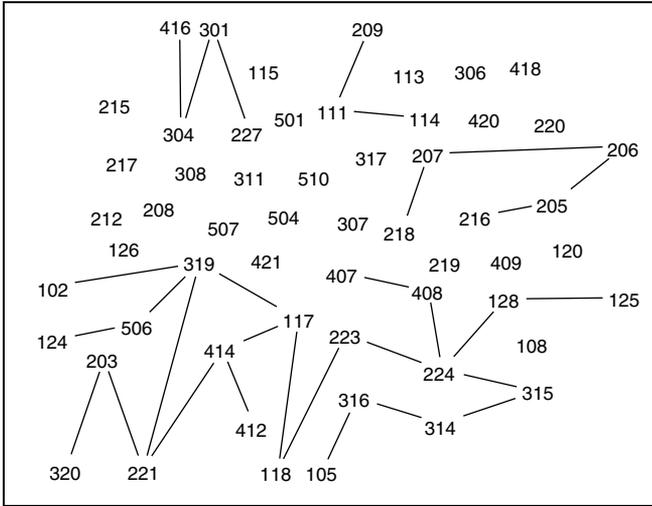
Panel B: A Village in Srisaket
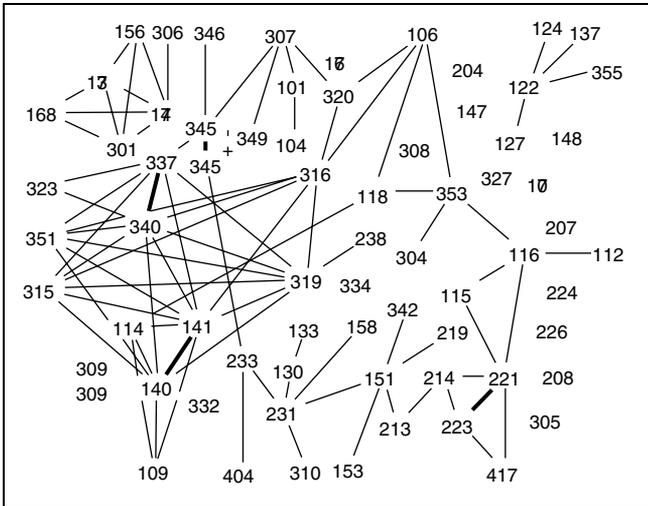
Figure 6.1. Examples of Kinship Networks

Remarks: Each node denoted by a number represents a household in the village. A line between two nodes represents a kinship relationship between the two households. The location of the nodes in the network maps does not correspond to the geographic location of the households.

conditioner, regular telephone, cellular telephone, refrigerator, sewing machine, motorcycle, car, pick-up truck, long-tail boat, large fishing boat, washing machine, electric iron, gas stove, electric cooking pot, bicycle, and stereo. Agricultural assets include tractor, aerator set, sprinkler, threshing machine, rice mill, and water pump. Business assets include machinery and equipment used for business such as a sewing machine and kitchenware. Land and other fixed assets include land plot, house, crop storage building, building for livestock, building for business, other building, pen for livestock, well, pond, water tank, fruit and other trees, and kitchen garden.

Note that the classification of fixed assets, by activity, is mainly for facilitating the interviews. Some of the assets are used in multiple activities, and we assign the total value of each asset to a particular activity based on the household's response. For example, a sewing machine may be used for both household and business purposes in households that provide sewing services to others. We treat the machine as a business asset if the household responds that they have the machine when we ask about their business asset. Similarly, the sewing machine is classified as household asset if the household answers so. Note that we do not double record the value of the same asset. A similar argument applies to the use of a pick-up truck for both household transportation and agricultural product delivery. Although not impossible, it is difficult to assign the percentage use of the assets for distinct activities.[5] In this chapter, we will primarily focus on the aggregate fixed assets rather than making the distinction between investments in different types of fixed assets. We do so for two reasons. First, as just mentioned, it is difficult to make a distinct separation between different types of assets. Second, if we focused only on investment in a particular type of assets, the number of observations with positive investment for each type would be too small for a meaningful regression analysis. However, we do check, when possible, the results when we use only investment in agricultural and business assets combined. The overall conclusions do not change.

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[5] We suggest this improvement when we discuss the questionnaire design in chapter 7 of this monograph.

Investment in Fixed Assets and Cash Flow from Production: Cash flow used in the study of investment–cash flow sensitivity is precisely cash flow from production, which is recorded as a cash inflow in the statement of cash flows. This is the variable used here and in the literature as a measure of liquidity. Gross investment in fixed assets is recorded as capital expenditure in the statement of cash flows. That is, investment is a cash outflow under the consumption and investment category in the household financial statements. This item is composed of two components, namely a change in fixed assets (net investment) and depreciation (replacement investment). Both investment and cash flow variables are normalized by the household's initial amount of fixed assets in each month.

Measure of Future Profitability: In the standard corporate finance literature, a firm's future profitability is measured by Tobin's q, which is typically proxied by the market-to-book value of the firm. However, to compute this measure, we would need the market price of the firm, and this is not available for non-traded firms in general and for households in particular. Some researchers use contemporaneous rate of return on assets (ROA) as a proxy for the firm's future profitability. However, contemporaneous ROA may not fully contain the profitability information of the investment if it is not a good indicator of the long-term or average return to investment. Among other reasons, this may be due to the fact that it takes several periods before the payoff of the investment is realized. For example, profitability from building a sprinkler system in a farm will not be realized until the crops are sold.[6]

In order to get a proxy for profitability, we proceed with the following procedure. First, the conventional rate of return on assets is defined as a household's accrued net income (plus interest expense) divided by the household's total assets. As discussed in chapter 5, the net income in our data embeds the contributions from human capital, while the total assets do not include human capital. As a result, the

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[6] Schündeln (2003) uses contemporaneous ROA as a proxy of Ghanaian firms' future profitability. He points out an identification problem of a firm's profitability and financial constraints and suggests an estimation strategy based on a structural model.

conventional ROA tends to overestimate the actual rate of return to physical assets. Our solution to this particular problem is to calculate an adjusted net income that takes out the effects from household human capital. The imputation of compensation to human capital was discussed earlier in chapter 5. Also, since we are interested in the profitability of the investment in fixed asset, we use total fixed assets, instead of total assets, as our denominator in the rate of return computation.

Finally, given the high frequency nature of our data, a contemporaneous monthly ROA is not a good measure of profitability, not only because it is volatile, but also because household's proceeds from investment may not be realized until the following months, as noted. This is especially the case for the households participating in seasonal production processes. To deal with this problem, we compute an average rate of return on fixed assets of the household over the next 12 months, and use this variable as our measure of household's future profitability instead. One of the very strong implicit assumptions here is that the households acted as if they had perfect foresight about their future profitability. We emphasize however that this variable is far from a perfect measure of future profitability as perceived by the household at the time of the investment. It is still possible that current cash flows are perceived to contain information about future productivity even controlling for actual, realized future productivity. The choice of this variable is dictated by the fact that the "market price" traditionally used for computing Tobin's q is not available for household surveys in developing economies.

Financing of Household Fixed Investment: Aside from cash flow from production, households can finance their capital expenditure by using various financial devices. Chapter 5 of the monograph classifies those devices into a decrease in deposits at financial institutions, a decrease in household's net position of ROSCA, (a recall of) lending, borrowing, net gifts received, and a decrease in cash holding. Except for a decrease in cash holding, these devices are reported under cash flows from financing in the statement of the cash flows in household financial statement. The number for a change in cash holding is reported naturally enough as the bottom line item of the statement of the cash flows.

6.3. THE NATURE OF HOUSEHOLD INVESTMENT

This section presents some descriptive statistics for household investment in fixed assets. We start with summary statistics on the size distribution of fixed assets. Then we look at the time series and frequency of positive investment events. Finally, we present summary statistics for positive investment that we use in our analysis.

6.3.1. Asset Size

Panel A of Table 6.1 shows the initial fixed assets of households in our sample. There are 531 households. The average household owns total fixed assets of 1.7 million Thai baht (THB).[7] The median household owns less than one-third of the mean household, implying that the distribution of asset holding is skewed. Most of the fixed assets (in currency value) are land, followed by household fixed assets such as vehicles, televisions, and furniture. Productive assets used in agriculture and business are relatively smaller. However, as mentioned earlier, we have to be careful that the distinction between different types of assets is less than clear. For example, households may use a pick-up truck for both household and business purposes. Land is also likely to be for agriculture in addition to residency. For this reason, the analysis in this chapter focuses mainly on total fixed assets rather than on particular types of assets.

In Panel B, households are stratified into three groups with roughly equivalent size by their initial net worth or wealth. Initial wealth is defined as total (real and financial) assets of the household minus its total liabilities at the beginning of the study (January 1999). The upper-third group has median total fixed assets almost four times higher than the middle-third counterpart, which in turn holds approximately

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[7] Note that the exchange rate has changed over time during the survey period. The exchange rate was approximately 36–37 THB per US dollar at the starting point of our data in January 1999. The exchange rate fluctuated to around 36 to 42 THB per US dollar from January 1999 to December 2005. At the time we write this monograph (November 2008), the exchange rate is approximately 34 THB per US dollar. Given these exchange rate fluctuations, we report only the value in local currency (baht) in the rest of this monograph.

Table 6.1. *Initial Fixed Assets of Households*

Variable	Number of Households	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Panel A: Whole sample						
Household fixed assets	531	129,116	322,405	18,587	50,552	97,703
Agricultural fixed assets	531	48,354	137,977	0	7,179	57,154
Business fixed assets	531	28,924	396,591	0	0	0
Land and other fixed assets	531	1,450,034	6,662,915	75,000	400,000	946,000
Total fixed assets	**531**	**1,656,428**	**6,792,188**	**154,167**	**483,108**	**1,223,043**
Panel B: By initial wealth						
Lower third						
Household fixed assets	177	35,911	37,570	6,884	23,853	55,421
Agricultural fixed assets	177	9,221	17,642	0	983	9,834
Business fixed assets	177	473	2,572	0	0	0
Land and other fixed assets	177	70,879	107,656	0	23,500	112,000
Total fixed assets	**177**	**116,484**	**115,930**	**32,479**	**85,093**	**173,080**
Middle third						
Household fixed assets	177	75,446	108,400	21,036	46,090	76,658
Agricultural fixed assets	177	24,136	35,335	983	5,901	39,171
Business fixed assets	177	3,838	17,305	0	0	0
Land and other fixed assets	177	426,889	255,340	248,500	413,430	606,100
Total fixed assets	**177**	**530,309**	**268,895**	**328,832**	**484,176**	**743,886**
Upper third						
Household fixed assets	177	275,990	516,262	54,183	101,519	343,880
Agricultural fixed assets	177	111,706	222,718	4,917	60,729	139,579
Business fixed assets	177	82,462	684,839	0	0	0
Land and other fixed assets	177	3,852,333	11,200,000	931,500	1,510,000	3,421,500
Total fixed assets	**177**	**4,322,491**	**11,300,000**	**1,183,797**	**1,872,218**	**3,796,824**

Remarks: Types of assets (household, agricultural, business, and land and other fixed assets) are categorized based on household's responses to the questionnaire. An asset is classified into just one type even though it is used for various objectives. See text for detail. The data cover the period during January 1999–December 2005.

six times more fixed assets than the lower-third group. The rankings of the types of asset allocations are the same across groups – land, household, agricultural, and business.

6.3.2. Descriptive Statistics on Investment: Event Level

Next, we look at investment in fixed assets. As we are interested in the financing of household investment, we will focus on investment value gross of depreciation, i.e. the value including investment to replace depreciated capital. Also, since we would like to examine liquidity constraints on household investment, we restrict our attention to only positive investment events and drop the observations with zero or negative investment. This strategy is similar to the idea used by Mayer and Sussman (2004) in their study of the capital structure of corporate firms. Essentially, we analyze how investment events are financed at the time of investment, with a relatively narrow window.

We do need to place this strategy of dropping the zero investment events in a larger context and set the stage for some auxiliary results that we report below. There is now an extensive literature on investment that tries to deal with the zero events. One branch of this literature argues that this is a simple aggregate problem. At the level of the plant, there are long stretches of zero investment periods, but at the level of firm, and certainly the industry, there is nontrivial investment most of the time. In this monograph we are not simply interested in aggregation but rather the behavior of individual household-business units. As we document below, for them investment is infrequent but large when it occurs. Further, we find that there is essentially zero or negative correlation between the number of positive investment events and median investment levels or investment rates.

These problems are prevalent in the literature on investment using models of costly adjustment. A large branch of that literature assumes a relatively high fixed cost of investment, coupled with positive marginal adjustments costs that are often asymmetric. Further, to reconcile with the episodic nature of the investment data, these fixed costs are drawn at random. This approach allows some anticipation and inter-relationship between the timing of investment, since depreciated capital must be replaced eventually, and the amount of

investment when it occurs. However, this depends on the distribution of the random variable generating variation in fixed costs. The more dispersed is that random variable, as with a uniform distribution, the more independent the extensive and intensive margin become. In the limit, with a high variance, the decision to invest carries little information about fundamentals, and there is little bias in investment equations that drop the zero investment events and focus on the intensive margin.[8] Put another way, an inappropriate specification of the statistical model generating the zeros, such as a tobit estimation, will cloud up the interpretation data. In fact, we have estimated a probit model of the binary indicator. We verify that while the binary investment decision is sensitive to cash flow, the decision to invest is not related to our profitability measure.[9]

Figure 6.2 shows the time series of investment from January 1999 to December 2005. In Panel A, we compute the total number of positive investment events from all of the households in our sample. The chart demonstrates the seasonality of investment with roughly two peaks per year. One peak is around the beginning of the year and the other one around the middle of the year. In Panel B, we present median investment values (in THB) computed over the positive investment events from the whole sample in each month. Again, the chart illustrates some seasonality in the investment of the households. However, the seasonality and cyclicality pattern is different from what we found in Panel A. A pair-wise correlation between the number of positive investment events (from Panel A) and the median household investment size (from Panel B) is –0.14 and not statistically significant. Finally, Panel C presents median investment rates computed across all positive investment events from our sample. An

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[8] Investment models with random fixed costs of adjustment include Caballero and Engel (1999), Thomas (2002), and Kahn and Thomas (2008).

[9] The regression coefficients (with corresponding standard error in parenthesis) of cash flow and future profitability from a probit regression of an indicator variable of investment (one if investment is positive and zero otherwise) are 0.0003 (0.0001) and –0.09 (0.07), respectively. Other control variables include calendar month and year dummy variables, village dummy variables, and total assets. The definitions of the variables are identical to those reported in Table 6.4.

Panel A: The Number of Positive Investment Events by Month

Panel B: Median Household Investment Size by Month (Baht)

Panel C: Median Positive Investment Rate by Month (%)
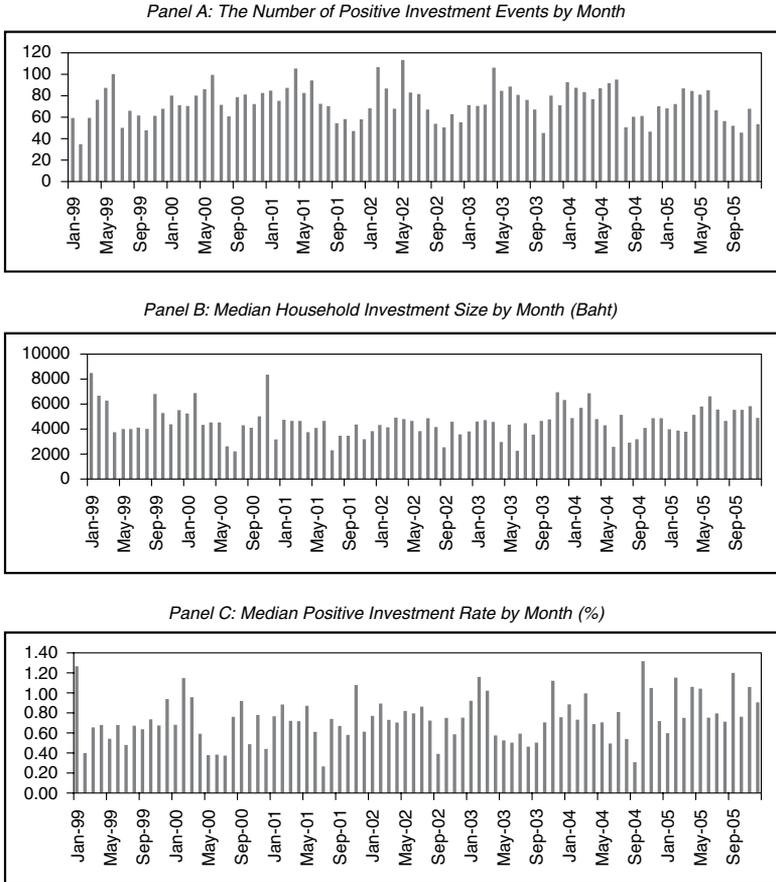
Figure 6.2. Time Series of Household Investment

investment rate is defined as the value of investment divided by the value of the assets at the beginning of the period. Again, the median investment rates show similar seasonal fluctuations, moving around 0.4–0.8% on average. The correlation coefficient between the median positive investment rate (from Panel C) and the investment values (from Panel B) is 0.50 and statistically significant at 1%. On the other hand, the correlation coefficient with the number of positive investment events (from Panel A) and the rates in Panel C is –0.08 and not statistically significant.

6.3.3. Descriptive Statistics on Investment: Household Level

At the household level, all of the total 531 households in our sample had invested in the assets classified (according to the household's own response) as household fixed assets at least once over this period; 279 households had invested in agricultural fixed assets; 377 households had invested in land; and 53 households had invested in business fixed assets. These findings reflect the fact that not all of the households in our sample participate in business or agricultural activities, although we should stress again that part of agricultural and business fixed assets might be already recorded as the household fixed assets or land.

Positive investment events are not at all frequent. Specifically, out of 56,793 household-month observations in our sample during January 1999–December 2005 (84 months), there are only 5,009 observations (11.34%) that have positive investment in total fixed assets. It is not surprising that the rich households tend to invest more often than the poor households: Within those positive investment events, 1,385 events (28%) are from the households in the lower-third initial wealth, 1,661 (33%) from the middle-third households, and 1,963 (39%) from the upper-third households.

These findings are alternatively presented in Table 6.2. We compute the frequency of investment events as the number of positive investment events divided by 84, i.e. the total number of months in the sample for each household. The results show that both the mean and the median household have the positive investment frequency of 0.14 and 0.13, which translates into approximately one investment event for every 12 months, i.e. about once every year. Investment in household fixed assets is more frequent than investment in agricultural assets, business assets, and land. When we stratify household by initial wealth, an interesting pattern emerges, as anticipated earlier. The households with lower initial wealth seem to invest slightly less frequently than the households with higher initial wealth (both the mean and the median frequency of 0.13 for the lower third vs. 0.15 for the upper third, statistically different at 5% for the mean).

Table 6.3 shows the summary statistics of the investment value, in baht (THB), and investment rate (%) computed from all of these

Table 6.2. *Summary Statistics for Frequency of Positive Investment Event at the Household Level*

Variable	Number of Households	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Total fixed investment	531	0.14	0.08	0.08	0.13	0.18
By type of assets						
Household fixed investment	531	0.13	0.08	0.07	0.11	0.17
Agricultural fixed investment	279	0.04	0.03	0.01	0.02	0.05
Business fixed investment	53	0.03	0.02	0.01	0.02	0.03
Land investment	377	0.06	0.05	0.02	0.03	0.08
By household's initial wealth						
Lower third	177	0.13	0.07	0.07	0.13	0.16
Middle third	177	0.13	0.08	0.08	0.12	0.17
Upper third	177	0.15	0.10	0.08	0.15	0.20

Remark: Types of assets (household, agricultural, business, and land and other fixed assets) are categorized based on household's responses to the questionnaire. An asset is classified into just one type even though it is used for various objectives. See text for detail. The data cover the period during January 1999–December 2005.

Table 6.3. *Summary Statistics for Positive Investment Events*

Variable	Number of Events	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Panel A: Investment size in baht						
Total fixed investment	5,009	18,196	65,352	1,441	4,298	13,493
By type of assets						
Household fixed investment	4,738	13,583	54,404	780	2,746	8,922
Agricultural fixed investment	715	21,747	41,926	2,967	7,418	23,971
Business fixed investment	103	51,335	235,050	1,969	5,102	17,995
Land investment	1,469	6,328	29,600	600	1,400	3,240
By Household's Initial Wealth						
Lower third	1,385	7,142	21,667	600	1,897	5,450
Middle third	1,661	12,091	30,189	1,216	3,336	9,776
Upper third	1,963	31,161	97,536	3,368	8,062	22,805
Panel B: Investment rate, %						
Total fixed investment rate	5,009	3.51	9.02	0.22	0.66	2.35
By type of assets						
Household fixed investment rate	4,738	443	29,205	0.72	2.57	10.17
Agricultural fixed investment rate	715	70,790	1,365,217	3.45	9.96	39.69
Business fixed investment rate	103	8,020,281	81,400,000	2.99	14.41	58.96
Land investment rate	1,469	867	31,569	0.14	0.34	1.08

By household's initial wealth

Lower third	1,385	6.93	13.30	0.49	1.72	6.44
Middle third	1,661	2.89	7.61	0.24	0.67	2.17
Upper third	1,963	1.62	4.68	0.15	0.38	1.06

Panel C: Rate of return on total fixed assets, annualized %

Rate of return on total fixed assets	5,009	1.07	3.23	0.06	0.40	1.26

By household's initial wealth

Lower third	1,385	1.98	4.63	0.06	0.46	2.19
Middle third	1,661	0.69	3.00	0.03	0.33	1.04
Upper third	1,963	0.75	1.73	0.09	0.43	1.15

Remark: Types of assets (household, agricultural, business, and land and other fixed assets) are categorized based on household's responses to the questionnaire. An asset is classified into just one type even though it is used for various objectives. See text for detail. The data cover the period during January 1999–December 2005.

positive investment events. Although Table 6.2 shows that poor households tend to invest only slightly less frequently than the rich, Panel A of Table 6.3 reveals that the monetary amount of investment is much smaller for the poor. The median investment for the upper-third group is about 8,062 THB while the number is only 1,897 THB for the lower-third group. In terms of the value of investment across types of assets, we find that the median investments range from 1,400 THB for land to 2,746 for household assets to 5,102 for business assets and to 7,418 for agricultural assets. The small amount of land investment reflects the fact that land investment includes both (frequent, smaller-value) land improvements and (infrequent, higher-value) land purchases. The median investment in total fixed assets in our sample is about 4,298 THB.

In Panel B of Table 6.3, we present summary statistics for the rate of investment in percentage terms. The numbers for the mean agricultural and business investment are astronomical because some households started with a very small amount of these assets, making the rate of investment extremely large.[10] However, the numbers for the median rate of investment in total fixed assets is 0.66%. The relatively poor households under this measure now invest at a higher rate than the rich ones. The median investment rate for the lower-third group is 1.72% while the rates for the middle-third and upper-third groups are 0.67% and 0.38%, respectively. The median rate of investment in business fixed assets is 14.41%, followed by agricultural fixed assets at 9.96% and household fixed assets at 2.57%. Land investment rate is low, with the median around 0.34%.

6.4. WEALTH AND LIQUIDITY CONSTRAINTS

In order to study liquidity constraints and investment, we adopt a strategy commonly used in corporate finance, namely investment–cash flow sensitivity analysis. As discussed earlier in section 6.1, this strategy assumes that capital markets are not perfect and internal finance is cheaper than external finance. Typically in the literature,

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[10] We exclude these outliers when we perform regression analysis.

firms (or households) follow a hierarchy of investment financing, starting first with internal funds, such as cash flow from production, to debt financing, and finally to equity financing. In effect, liquidity constraints imply that investment is sensitive to cash flow of the firm and the sensitivity of investment to cash flow is higher for the more constrained firms, as these firms have to rely on their internally generated funds, i.e. cash flow, for their investment financing.

For our household investment, the empirical strategy consists of a regression analysis of the household investment onto the cash flow of the household, controlling for measure of future profitability of the household productive activities:

$$investment_{i,t} = \alpha + \beta \ cash\_flow_{i,t} + \gamma \ future\_profitability_{i,t}$$
$$+ \omega_{i,t} + \Gamma X_I + \Delta Z_t + \varepsilon_{i,t}$$

where $investment_{i,t}$ is household i's fixed investment normalized by fixed assets at the beginning of month t, $cash\_flow_{i,t}$ is cash flow from production during month t normalized by fixed assets at the beginning of month t, $future\_profitability_{i,t}$ is measured by the simple 12-month average rate of return to fixed assets of household i from month t to month $t+11$, $\omega_{i,t}$ is household i's fixed assets at the beginning of period t, X_I is a vector of time-invariant dummy variables for each village I where household i resides, and Z_t is a vector of time-variant dummy variables for calendar months (January to December) and calendar year (1999 to 2005). If future profitability is perfectly controlled, the null hypothesis of no liquidity constraints implies that the regression coefficient on cash flow (β) should be zero. Comparing between two groups of households with low and high degrees of liquidity constraints, we expect that β for the regression coefficient of the less constrained (or unconstrained) households should be lower than the coefficient of the more constrained households, with the caveats noted earlier.

Table 6.4 presents the results from the investment–cash flow sensitivity analysis. The table focuses on investment in total fixed assets as the dependent variable. The investment in period t and the cash flows in t are normalized by beginning-of-period total fixed assets, i.e. total fixed assets at the end of period *t-1*. Column 1 shows that the

Table 6.4. *Investment–Cash Flow Sensitivity*

	Panel A: Dependent Variable = Investment in Total Fixed Assets (%)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cash flow t/total fixed assets t-1	0.272***	0.259***	0.249***						
	(0.012)	(0.012)	(0.012)						
(Cash flow t, t-1, t-2)/ Total fixed assets t-1				0.198***	0.181***	0.171***			
				(0.012)	(0.012)	(0.012)			
(Cash flow t,..., t-5)/ Total fixed assets t-1							0.252***	0.231***	0.220***
							(0.014)	(0.015)	(0.015)
Future profitability		26.98***	31.44***		29.07***	33.49***		25.38***	29.58***
		(3.79)	(3.90)		(3.89)	(4.00)		(3.92)	(4.03)
Total fixed assets t-1			0.0544**			0.0685***			0.0785***
			(0.025)			(0.025)			(0.025)
Calendar month dummies	No	No	Yes	No	No	Yes	No	No	Yes
Calendar year dummies	No	No	Yes	No	No	Yes	No	No	Yes
Village dummies	No	No	Yes	No	No	Yes	No	No	Yes
Constant	2.509***	2.270***	−54.28**	2.799***	2.548***	−69.19**	2.666***	2.468***	−79.86***
	(0.13)	(0.13)	(26.8)	(0.13)	(0.14)	(27.3)	(0.13)	(0.14)	(27.2)
Observations	5009	5009	5009	5009	5009	5009	5009	5009	5009
R-squared	0.09	0.10	0.12	0.05	0.06	0.08	0.06	0.07	0.09

Remark: The data cover the period during January 1999–December 2005. *Cash flow* is cash flow from production as described in the construction of the accounts in this monograph. *Future Profitability* is the average of the monthly rates of return on household's total fixed assets over the next 12 months. Both cash flows and future profitability are normalized by household's total fixed assets at the beginning of the month. All regressions are OLS. Standard errors are in parentheses. * is statistically significant at 10%; ** is statistically significant at 5%; and *** is statistically significant at 1%.

coefficient on cash flow is 0.27 and significant at 1%. That is, if the cash flow to asset ratio of a household increases by 0.1, its investment rate (i.e. investment to asset ratio) will increase by 0.027 percentage point. However, as cash flow evidently contains information on future profitability, in column 2 we add the average rate of return to fixed assets over the next 12 months, after the investment takes place, as our control variable for future profitability. The result shows that the coefficient for cash flow drops slightly to 0.26 but is still statistically significant at 1%. The coefficient for future profitability is 26.98 and also significant at 1%, with the expected positive sign. Finally, we add total fixed assets at the beginning of the month; dummy variables for calendar months and years to control for seasonality and cyclicality; and dummy variables for village fixed effects. The overall results as shown in column 3 do not change. The coefficients for cash flow and future profitability are 0.25 and 31.44, and are still statistically significant at 1%.

Columns 4 to 6 replicate column 1 to 3 but use cumulative cash flows over the past three periods, i.e. cash flows for *t*, *t-1*, and *t-2*, instead of the contemporaneous cash flow at *t* only. The regression coefficient of 3-month cumulative cash flow is 0.17 in the fully controlled specification as shown in column 6. Columns 7 to 9 repeat the same exercises but use cumulative cash flows over the past six months instead. Column 9 shows that the coefficient from the fully controlled regression is 0.22. It seems that sensitivity to cash flow remains; though it drops in the near terms, the coefficients rise again for the six-month horizon. The coefficient for future profitability is positively significant in all cases (though slightly higher for the medium term).

Table 6.5 reports the regression results when we stratify the sample by household initial wealth. Column 1 shows that the regression coefficients for the lower-third group have expected signs and are statistically significant at 1%. The magnitude for the cash flow variable is 0.24 in the fully controlled specification. As reported in column 2, the coefficient of cash flow for the upper-third group is lower at 0.17, but it is still significant at 1%. The result suggests that low-wealth households face more liquidity constraints than the high-wealth households. It is important to note that the investment of both the rich and

Table 6.5. *Initial Wealth and Investment–Cash Flow Sensitivity*

Dependent Variable: investment in Fixed Assets (%)	Initial Wealth					
	Lower Third (1)	Upper Third (2)	Lower Third (3)	Upper Third (4)	Lower Third (5)	Upper Third (6)
Cash flow t/Total fixed assets $t-1$	0.244*** (0.022)	0.168*** (0.028)				
(Cash flow t, $t-1$, $t-2$)/Total fixed assets $t-1$			0.152*** (0.022)	0.0611*** (0.021)		
(Cash flow t,…, $t-5$)/Total fixed assets $t-1$					0.200*** (0.026)	0.0487** (0.023)
Future profitability	28.66*** (8.29)	12.55* (6.44)	28.20*** (8.55)	17.54*** (6.51)	23.28*** (8.61)	19.52*** (6.44)
Total fixed assets $t-1$	−0.167 (0.11)	0.0225 (0.017)	−0.134 (0.11)	0.0269 (0.017)	−0.0821 (0.11)	0.0301* (0.017)
Calendar month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes	Yes	Yes
HH fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	182.8 (119)	−24.05 (18.4)	146.6 (122)	−28.76 (18.5)	91.65 (122)	−32.20* (18.5)
Observations	1385	1963	1385	1963	1385	1963
R-squared	0.12	0.05	0.07	0.04	0.07	0.04

Remarks: The data cover the period during January 1999–December 2005. *Cash flow* is cash flow from production as described in the construction of the accounts in this monograph. *Future Profitability* is the average of the monthly rates of return on household's total fixed assets over the next 12 months. Both cash flows and future profitability are normalized by household's total fixed assets at the beginning of the month. All regressions are OLS. Standard errors are in parentheses. * is statistically significant at 10%; ** is statistically significant at 5%; and *** is statistically significant at 1%.

the poor households are strongly associated with the higher future rate of return to assets, though the rich less so. Columns 3–4 and columns 5–6 repeat the same regression specifications for three-month and six-month cumulative cash flows, respectively. In both cases, the coefficients of cash flow for the poor households are higher than the coefficients for the rich households. Indeed, for the rich households, the coefficients for the three-month and six-month cumulative cash flow are successively smaller than the coefficient for the contemporaneous cash flow. On the other hand, for the poor households, the pattern mimics the overall sample and is less clear.

As we have seen earlier in Table 6.3, the mean and the median returns on fixed assets of the lower-third initial wealth households (1.98% and 0.46%) are higher than those for the upper-third initial wealth households (0.75% and 0.43%). Since the investment of the poor household is more sensitive to cash flow and their return on fixed assets is higher than the rich households, the overall results we have so far suggest that the poor households in our sample seem to be more liquidity constrained than the rich households.

6.5. KINSHIP NETWORKS AND LIQUIDITY CONSTRAINTS

The results from the previous section suggest that both the low-wealth and the high-wealth households in our sample seem to face liquidity constraints, although the high-wealth households seem to be less constrained than the low-wealth. In this section, we explore whether local kinship networks help mitigate these constraints, and to what degree, by adding to the regression the interaction term of the cash flow and the indicator for being in a kinship network. The results are reported in Table 6.6. Again, all of the regressions control for calendar months, years, and village fixed effects, as well as household total fixed assets at the beginning of the period.

For the whole sample, the effect of kinship networks is mixed. Column 1 shows that the coefficient for contemporaneous cash flow is 0.26 and statistically significant at 1%. The interaction term is not statistically significant, however. Column 2 shows similarly the coefficient

Table 6.6. *Kinship Networks and Investment–Cash Flow Sensitivity*

Dependent Variable: Investment in Fixed Assets (%)	Whole Sample			Initial Wealth					
				Lower Third	Upper Third	Lower Third	Upper Third	Lower Third	Upper Third
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Network dummy	0.294	0.576*	0.347	2.213**	–0.00977	2.088**	0.123	2.199**	–0.226
	(0.31)	(0.32)	(0.32)	(1.01)	(0.25)	(1.05)	(0.26)	(1.05)	(0.25)
Cash flows t/Total fixed assets $t-1$	0.262***			0.317***	0.262***				
	(0.022)			(0.042)	(0.044)				
Network dummy × Cash flows t /Total fixed assets $t-1$	–0.0177			–0.0969**	-0.156***				
	(0.027)			(0.049)	(0.055)				
Cash flows to total fixed assets t, $t-1$, $t-2$		0.246***				0.245***	0.306***		
		(0.029)				(0.055)	(0.067)		
Network dummy × Cash flows t, $t-1$, $t-2$/Total fixed Assets $t-1$		–0.0910***				–0.109*	–0.266***		
		(0.032)				(0.060)	(0.070)		
Cash flows to total fixed assets t,…, $t-5$			0.221***					0.254***	0.0540*
			(0.026)					(0.050)	(0.032)

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Network dummy × Cash flows $t,…,t$-5/Total fixed assets t-1			−0.00210					−0.0708	−0.0114
			(0.031)					(0.059)	(0.045)
Future profitability	31.49***	33.67***	29.53***	28.36***	12.33*	28.28***	12.69*	23.07***	19.86***
	(3.90)	(4.00)	(4.05)	(8.30)	(6.44)	(8.57)	(6.62)	(8.66)	(6.47)
Total fixed assets t-1	0.0540**	0.0652**	0.0780***	−0.170	0.0218	−0.135	0.0239	−0.0792	0.0293*
	(0.025)	(0.025)	(0.025)	(0.11)	(0.017)	(0.11)	(0.017)	(0.11)	(0.017)
Calendar month dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	−54.10**	−66.14**	−79.68***	183.5	−23.31	145.7	−25.64	86.35	−31.12*
	(26.8)	(27.3)	(27.2)	(119)	(18.4)	(122)	(18.5)	(122)	(18.6)
Observations	5009	5009	5009	1385	1963	1385	1963	1385	1963
R-squared	0.12	0.08	0.09	0.12	0.05	0.07	0.04	0.08	0.04

Remarks: The data cover the period during January 1999–December 2005. *Network dummy* equals one if a household belongs to one of the village kinship networks and zero otherwise. *Cash flow* is cash flow from production as described in the construction of the accounts in this monograph. *Future Profitability* is the average of the monthly rates of return on household's total fixed assets over the next 12 months. Both cash flows and future profitability are normalized by household's total fixed assets at the beginning of the month. All regressions are OLS. Standard errors are in parentheses. * is statistically significant at 10%; ** is statistically significant at 5%; and *** is statistically significant at 1%.

for three-month cumulative cash flow at 0.25, which is also significant at 1%, but the kinship networks now help mitigate the investment–cash flow sensitivity by 0.09. Finally, column 3 presents the result for six-month cumulative cash flow. The coefficient for cash flow is 0.22 and significant at 1%, but the coefficient of kinship networks is again not statistically significant.

Since we infer from the earlier regressions that liquidity constraints are more acute for the poor households, we stratify our sample by initial wealth. Columns 4 to 7 show that local kinship networks seem to help reduce the sensitivity of household fixed investment to contemporaneous cash flow and to three-month cumulative cash flow for both the low-wealth and high-wealth households. However, the reduction is considerably greater for the richer third. On the other hand, columns 8 and 9 reveal, that this network effect does not exist for either group for six-month cumulative cash flow. Still sensitivity of the rich is already small, so it is less surprising there is no further reduction. Finally, since kinship is largely exogenous, our hope is that the results are not biased, as one worries otherwise that those households are not admitted to the network due to their adverse characteristics.[11]

6.6. FINANCING HOUSEHOLD INVESTMENT

We have learned from the previous sections that (1) both rich and poor households in our sample seem to be liquidity constrained; (2) poor households seem to be more liquidity constrained than rich households; and (3) kinship networks seem to help mitigate liquidity constraints for both the rich and the poor households (at least up to three months). We thus explore further how households finance their investment and how the kinship networks help. To do so, we apply the variance decomposition method described in chapter 5. The method decomposes the variance of investment deficit, i.e. investment in

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[11] Note also that the correlation between being in a network and initial wealth is essentially not different from zero (correlation coefficient = –0.06). Therefore, being a part of a network is exogenous to wealth.

total fixed assets minus contemporaneous cash flow from production, into various financing mechanisms: decreases in deposits at financial institutions, decreases in net ROSCA position, decreases in lending position, borrowing, net gifts received, decreases in cash holding, and decreases in consumption.[12]

Panel A in Table 6.7 presents this variance decomposition for all positive investment events in our sample. The result shows that 93% of the variation in investment deficits can be explained by the variation in a decrease in cash holding. Deposits at financial institutions explain 4%. Net gifts received account for 0.4% of the deficit financing while borrowing is responsible for 2.5%. Decreases in lending and ROSCA position play minor role in the financing of investment deficit. Finally, 0.3% comes from a reduction in household consumption.

Panels B1 and B2 compare and contrast the financing mechanisms for poor households without and with kinship networks, respectively. The results are striking. For poor household without a family network, 78% of their investment deficit financing is from cash holdings while 0.2% is from borrowing and 3% is from gifts. 13% comes from a reduction in consumption, i.e. households finance investment in part by giving up on current consumption expenditures. In contrast, poor households belonging to kinship networks finance their investment deficits relatively more from borrowing, which accounts for almost 8% of the deficit variation. The role of gifts is also relatively bigger at 8%. The consumption effect goes away. Cash holding still accounts for the largest portion at 77% for this group of households. Deposits at financial institutions account for a bit over 6%, as opposed to 5% for the households without the networks, suggesting a complementary connection of the informal family networks to formal financial institutions.

Panels C1 and C2 look at the rich households in the upper-third initial wealth distribution. Use of savings accounts and borrowing

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[12] There are two differences between the method used in chapter 5 and in this chapter. First, in chapter 5, the variance decomposition is applied to a time-series of each household separately while in this chapter we apply the method to all the investment events in our pooled sample. Second, we include zero and negative investment events in chapter 5 while we focus only on the positive investment in this chapter.

Table 6.7. *Variance Decomposition of Investment Deficits*

	F1	F2	F3	F4	F5	F6	F7	
Panel A: Whole sample								
F1	7.62%	0.00%	0.01%	–2.01%	–0.20%	–1.38%	–0.04%	4.01%
F2	0.00%	0.08%	0.00%	0.02%	0.01%	–0.06%	–0.01%	0.03%
F3	0.01%	0.00%	0.19%	0.00%	0.02%	–0.52%	0.00%	–0.30%
F4	–2.01%	0.02%	0.00%	7.10%	0.00%	–2.60%	–0.02%	2.49%
F5	–0.20%	0.01%	0.02%	0.00%	2.15%	–1.39%	–0.23%	0.37%
F6	–1.38%	–0.06%	–0.52%	–2.60%	–1.39%	99.08%	–0.04%	93.08%
F7	–0.04%	–0.01%	0.00%	–0.02%	–0.23%	–0.04%	0.66%	0.32%
Total								**100.00%**
Panel B1: Lower third initial wealth without network								
F1	5.42%	0.00%	0.01%	–0.40%	–0.17%	0.12%	0.02%	5.00%
F2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
F3	0.01%	0.00%	0.78%	–0.57%	–0.20%	0.02%	–0.04%	0.01%
F4	–0.40%	0.00%	–0.57%	1.38%	0.03%	–0.38%	0.16%	0.22%
F5	–0.17%	0.00%	–0.20%	0.03%	4.25%	–0.42%	–0.22%	3.28%
F6	0.12%	0.00%	0.02%	–0.38%	–0.42%	79.46%	–0.49%	78.31%
F7	0.02%	0.00%	–0.04%	0.16%	–0.22%	–0.49%	13.75%	13.18%
Total								**100.00%**
Panel B2: Lower third initial wealth with network								
F1	105.05%	0.01%	0.16%	–98.43%	1.92%	–3.14%	0.79%	6.35%
F2	0.01%	0.29%	0.00%	0.00%	–0.03%	–0.32%	0.01%	–0.04%
F3	0.16%	0.00%	4.19%	1.20%	–0.39%	–4.56%	–0.08%	0.52%
F4	–98.43%	0.00%	1.20%	165.20%	–5.15%	–53.57%	–1.27%	7.97%
F5	1.92%	–0.03%	–0.39%	–5.15%	14.84%	–0.44%	–2.80%	7.95%
F6	–3.14%	–0.32%	–4.56%	–53.57%	–0.44%	141.55%	–2.76%	76.75%
F7	0.79%	0.01%	–0.08%	–1.27%	–2.80%	–2.76%	6.59%	0.49%
Total								**100.00%**

Remarks: The data cover the period during January 1999–December 2005. *Investment deficit* is the financial institutions, F2 = Decrease in net ROSCA position, F3 = Lending, F4 = Borrowing,

are slightly higher for those without family networks in the village. The results show that cash holding accounts for almost the entire investment deficit financing, at 89% for those without the network and a larger 97% for those within the networks. This finding is very important. We found earlier that the investments of these rich households are slightly sensitive to their cash flows, suggesting that they face only mild liquidity constraints. The findings from the variance decomposition suggests otherwise: Internal finance is still very important for these rich households. However, their source of internal finance is from their stock of cash in hand rather than the flow of cash from production activities. The lesson here is that costly access

F1	F2	F3	F4	F5	F6	F7	

Panel C1: Upper third initial wealth without network

F1	F2	F3	F4	F5	F6	F7	
5.98%	−0.01%	−0.09%	−0.28%	0.16%	−0.38%	0.12%	5.51%
−0.01%	0.08%	0.00%	−0.03%	−0.01%	0.10%	0.00%	0.14%
−0.09%	0.00%	0.28%	−0.01%	−0.01%	−0.17%	0.02%	0.02%
−0.28%	−0.03%	−0.01%	8.24%	0.00%	−5.19%	−0.03%	2.71%
0.16%	−0.01%	−0.01%	0.00%	1.23%	0.44%	−0.01%	1.79%
−0.38%	0.10%	−0.17%	−5.19%	0.44%	94.38%	0.00%	89.18%
0.12%	0.00%	0.02%	−0.03%	−0.01%	0.00%	0.55%	0.65%
							100.00%

Panel C2: Upper third initial wealth with network

F1	F2	F3	F4	F5	F6	F7	
4.58%	0.00%	0.01%	−0.30%	−0.06%	−2.08%	0.01%	2.16%
0.00%	0.01%	0.00%	0.00%	0.00%	−0.01%	0.00%	0.00%
0.01%	0.00%	0.07%	−0.02%	0.00%	−0.47%	0.00%	−0.41%
−0.30%	0.00%	−0.02%	1.68%	0.01%	−0.51%	0.03%	0.90%
−0.06%	0.00%	0.00%	0.01%	0.38%	−0.40%	−0.05%	−0.12%
−2.08%	−0.01%	−0.47%	−0.51%	−0.40%	99.81%	0.46%	96.80%
0.01%	0.00%	0.00%	0.03%	−0.05%	0.46%	0.20%	0.66%
							100.00%

household's gross capital expenditure minus cash flow from production. F1 = Decrease in deposit at F5 = Net gifts received, F6 = Decrease in cash holding, and F7 = Decrease in consumption.

to external finance could be different from cash flow constraints implied by the investment–cash flow sensitivity analysis. Even the rich households in our sample could face acute liquidity constraints on external finance that force them to hold cash in hand in order to finance investment instead of holding other income-generating assets.[13]

[13] The study of stock of liquidity (i.e. cash on hand) and investment is more limited than the study using flows of liquidity (i.e. cash flow). This is because the reliable data on cash balance is less available than the data on cash flows. An exception is Hoshi, Kashyap and Scharfstein (1991). The paper looks at the holding of short-term security holdings as a proxy for firm's stock of liquidity.

Panels C1 and C2 of Table 6.7 also show that the order of magnitude for external financing devices for the rich households is similar to what is suggested in the standard corporate finance literature – external debt is used before external equities. In our context, we find that borrowing accounts more for investment deficit financing than gifts received, which are deemed as equity-like securities in the framework proposed in this monograph. For the poor households, however, gifts and debt are similar for those with kinship networks, and gifts are more important than debt for the households without networks. Further research on the costs and benefit of gifts as equity is needed.

So far, we have learned that gifts and borrowing seem to matter for the poor households that have relatives in the village. Our analysis relies on two sets of data. First, we use the financial statements constructed as described earlier in this monograph. This financial data does not distinguish between financing from within versus outside the village. Second, we use the village kinship networks constructed from demographic information in the household composition module of the questionnaire. We have the sharp impression that networks offer direct help somehow. Still, it is possible that networks signal reliability that allow members to borrow more, and share risk more, outside the village, not from the within the village network itself. For example, networks members could form a joint liability group for outside loans from Bank for Agriculture and Agricultural Cooperative (BAAC).

The survey, however, also provides us with an opportunity to perform a consistency check on networks and within-village activities, based on a different set of questions from the questionnaire. We look at the questions directly recording gift and borrowing transactions from within versus outside the village. Specifically, we compute the percentages of gifts and borrowing from within the village and compare them with those from outside the village. We use the data from the same period as the variance decomposition analysis presented earlier, stratified by initial wealth and kinship network. The results in Table 6.8 show that the fractions of gifts and borrowing from within the village are higher for the households within the networks if they are poor. This is consistent with a direct network effect. The effect

Table 6.8. *Percentages of Gifts and Borrowing from within and outside the Village, by Initial Wealth and Kinship Networks*

	Percentage of Gifts from…		Percentage of Borrowing from…	
	Within Village	Outside Village	Within Village	Outside Village
Lower third initial wealth				
Without Network	14.8%	85.2%	41.7%	58.3%
With Network	15.7%	84.3%	48.8%	51.2%
Upper third initial wealth				
Without Network	21.5%	78.5%	23.9%	76.1%
With Network	24.6%	75.4%	19.6%	80.4%

Remarks: The data cover the period during January 1999–December 2005. Gifts are total cash and in-kind gifts received by the households. Borrowing is total cash and in-kind borrowing by the households. A household is in a network if it has at least one relative living in the same village.

is also there for the relatively rich in networks with respect to gifts. But relatively rich people in networks actually borrow less within the village than do rich non-network households. In any event, there may yet be indirect beneficial effects from networks for both poor and rich. Outside-village gifts and loans are larger than within-village gifts and loans for all cases.

6.7. CONCLUSION

This chapter illustrates how we apply our constructed financial statements to the analysis of household behavior. Specifically, we show how useful the detailed items in household financial accounts are for the analysis of liquidity constraints and investment financing. In this case, we borrow the theoretical frameworks on pecking-order hypothesis and empirical strategies on investment–cash flow sensitivity from corporate finance and apply them to the study of household behavior. Finally, we also show that non-financial information gathered in a household survey, such as household and village demography, can be integrated into the analysis of household financing behavior.

In sum, we find that rural households in our sample seem to face liquidity constraints. This is particularly so for the poor households. The constraints are partially mitigated by kinship networks. Although it may be logical that investment–cash flow sensitivity implies liquidity constraints, the reverse is not guaranteed. Firms or households with liquidity constraints may have investment not so sensitive to their cash flow if their investment is financed by another source of internal funds, namely the stock of cash in hand. Indeed, it remains possible that constraints are so binding that there is little investment in the first place.

Discussion: Measurement and Modeling

This monograph provides a conceptual framework for viewing households as corporate firms. We show how to construct household financial statements from a household survey and how to use the financial accounts in an analysis of household finance. As a conclusion, this chapter discusses various issues regarding measurement and the modeling of households as corporate firms. Section 7.1 provides the lessons we learned from applying the framework to the Townsend Thai Monthly Survey. Section 7.2 lists the limitations of the financial accounts in general. Finally, section 7.3 concludes with the implications of our work for modeling household behavior in an analysis of household finance.

7.1. LESSONS FOR HOUSEHOLD SURVEYS

We use the data from the Townsend Thai Monthly Survey in this monograph. Although that survey serves many of our objectives in the analysis of household financial decisions, it is not perfect and there is room for improvement. We list some of the issues with the data for the benefit of other researchers.

First, we do not keep track of the price changes and market value of fixed assets well enough. Although we do update the value of land when there is a major improvement that affects the value of that land, we do not adjust the market value of other fixed assets until they are sold, when we record the cumulative increase (decrease) in

value as capital gain (loss). We do depreciate the value of fixed assets (excluding land) every period, though the appropriate depreciation rates can be questioned, and no doubt improved. Similarly, we do not adjust the value of inventory period-by-period even though there are changes in the market price. The changes in prices and market values of inventory could be crucial if the household purchases inputs and sells outputs based on price movements, i.e. the households strategically manage their inventory. Yet these are complicated issues. Subjective assessments of value, relevant to behavior, may not always square with the reality of the market. There are some trade-offs here. Conservative accounting practices value assets at historical costs while Market-to-market requirements in the financial industry may be more appropriate when markets are thick and volatility is not excessive.

Second, and related, we do not directly ask for the markups of retail business profits but instead calculate the implied markups from recent average experience, i.e. the markup is calculated from total revenues over the past three months divided by total expenses on inputs over the same period. This strategy is based on the arbitrary assumption that on average goods stay in inventory for less than three months. In practice of course, that varies with activities and varies over households. Directly asking for markups and revenues in each period may provide more accurate information if one would like to compute the profit of household enterprise. This was the conclusion of de Mel, McKenzie and Woodruff (2009), that profit questions are more effective for business owners in Sri Lanka than detailed revenue and expense questions. They conjecture that it is the inventory valuation part that is causing much of the problem. Alternatively, we can ask for the average time that inventories stay in the household, and then compute the markup from total revenues over the holding period divided by total expenses on inputs over the same period. This alternative suggestion may be more appropriate if the household is not familiar with the concept of profits and markups. Again, these issues arise because neither the enumerators nor the households use bar codes to track purchase and sale of each item in inventory, and because we do not re-value stocks according to market prices, as discussed earlier.

Third, we do not distinguish well the use of fixed assets for production activity versus consumption activity. This could downwardly bias our estimates on return to assets. Obviously, some of the assets that we put in the denominator of the ROA calculation may not actually be used as production inputs. We could have asked the household to specify the percentage of time that each fixed asset was used in each different activity, somewhat akin to what a tax agency such as the US Internal Revenue Service (IRS) does for single proprietorships.

Fourth, we do not treat very well the consumption of household durables. Household durables such as clothing last for more than one month and in theory should be treated as fixed assets providing a service flow. In other words, expenditure on household durables is not equivalent to consumption of the purchased goods. When we treat expenditure on household durables as non-food consumption, total household consumption becomes lumpier than it should be. Computing the user cost (service flow) of consumer durables should improve the accuracy of the financial accounts. In addition, although we treat housing structures and vehicles as household fixed assets, the service flows generated by these assets that would contribute to household consumption were not recorded as the output and income in the accounts, making our estimates of ROA downwardly biased.

Fifth, we did not distinguish point of sale, and purchase, other than inside versus outside the village. We have noted elsewhere in an analysis of the data that revenues are higher for sales outside the villages, and expenses lower for purchases outside the village, but this begs the question of whether the household is, or is not, subtracting transport and transportation costs in marketing. As argued by Singh, Squire and Strauss (1986), the difference in on-farm and off-farm prices of inputs (including labor) and outputs could affect household decisions. Note that we do ask about gasoline and of course the value of the pick-up truck, etc., so not everything in ROA is distorted, though we cannot attribute these costs to particular activities. The industrial organization of rural markets would be better studied if we had these missing numbers. For household labor supply, transportation costs are asked and recorded as a job expense in the labor activity module in the Townsend Thai Monthly Survey.

Sixth, some agricultural households are often involved in labor exchange. If the household receives this help we should consider it as labor cost of production that is financed by a gift received. In principle, it should be recorded as an expense in the income statement, thus making net income lower than it otherwise would be. Consequently, retained earnings are lower. At the same time, cumulative net gifts received goes up by the amount as the incoming gift, and therefore there is no net change in overall household wealth in the balance sheet. In the statement of cash flows, this transaction should be also recorded as a cash inflow from financing. Since the amount is the same as the decrease in net income in the cash flow from production, there is no net change in cash holding of the household. Likewise, if the household helps others in work, the outgoing gift should be treated as revenue from labor supply and a decrease in cumulative net gifts received. Unfortunately, although we ask for labor exchange (in days and hours) in the Townsend Thai Monthly Survey, we do not ask the value (in baht) of the transaction. Asking this value directly would improve the construction of the accounts. We could impute this value but have not done so because we do not know enough about the characteristics of the labor exchange members who are not in our survey sample. Without this information, we cannot impute the opportunity cost of their labor service.

Seventh, we have made conventional if arbitrary decisions about how to classify certain goods and transactions. For example, we treat electricity as a consumer expense whereas part of it should be treated as a cost of production. Similarly, we treat all inventories as working capital in production activities although it would be better if we could distinguish these inventories by their objectives, as described in chapter 4. These distinctions are imperative if we would like to analyze household motives in holding inventory as working capital, as fixed assets, or as buffer stock savings.

Eighth, expenditure on education should be treated as investment in the education part of human capital. Unfortunately, as we discussed earlier in chapter 4, it is very difficult to put an accurate value on the stock of human capital of the household. As a result, in this monograph we treated expenditure on education as non-food

consumption. Similarly, nutrition intake (certain consumption levels or items) and health expenditure could be considered as an investment in the person, to maintain health human capital and allow the person to function effectively, as in the literature on subsistence income. The treatment of investment in human capital, and intangible assets in general, deserves more attention, and we hope that this monograph will generate more research along this line. We mention the issue here because we find the conceptualization attractive, but implementation is difficult.

Ninth, we mention the formation or dissolution of households, but this is an important topic and it deserves more attention. We proposed earlier in this manuscript one possible approach to study the formation, migration, and dissolution of households, namely viewing them as mergers and spin-offs of corporate firms. In our opinion, this dynamic household issue is not about the accounts per se but rather the problem of measurement, the incorporation of newly arrived individuals on whom we have little previous information or the separation of former household members on whom we are no longer able to acquire information. This issue is important as new household members might bring in assets while outgoing members possibly take some assets with them or, oppositely, continue providing resources to the household. Indeed gifts play a nontrivial role in wealth accumulation and depletion, and the accounts draw sharp attention to this issue. However, to do a better job, we need to track and interview household members not only as they come and go. Ideal surveys should sample in such a way as to incorporate household members living in different structures but effectively acting as one integrated unit.

Finally, our estimate of cash in hand depends on our guess of initial cash holding. In subsequent periods, changes in cash holding are computed as the bottom line in the statement of cash flows, i.e. the net cash inflow. When our guess of cash holdings goes negative we adjust upward the initial guess. This strategy may underestimate the amount of cash in hand. On the other hand, as we have mentioned previously, cumulative underestimates of expenditures can lead us to overstate the stock of cash in the house (although we think that the measurement error for the change in cash in each period is not large).

We recognize that this may be a serious issue, but directly asking the household for the amount of their cash holding can be culturally difficult. The Financial Diaries Project discussed in chapter 3, e.g. Rutherford (2002), Ruthven (2002) and Collins (2005), did ask about cash balances in hand, along with the minute details of cash revenues and expenditures in both production and financing activities. After several periods households seem to learn how to answer and may be acquiring from the interviews an implicit knowledge of accounting. In effect, both cash flow and balance sheet items lie behind the conceptualization, though the Financial Diaries are not as comprehensive as the balance sheets, income statements, and statements of cash flows we have constructed here. We include not only cash and all in-kind transactions but also all real physical assets. Perhaps our accounts could be used as a crosscheck on household responses. This would however require that we brave risking directly asking households about cash in hand, and we have to bear this consideration in mind in future experimentation.

7.2. LIMITATIONS OF FINANCIAL ACCOUNTS

We argued earlier that financial accounting is a useful tool for the study of household finance, especially when researchers are interested in both the short-term and the long-term financial situations of the households. However, financial accounting has limitations and may not be appropriate for certain studies. We list some of the limitations here.

First, financial accounting presents financial information of a household in the aggregate at the household level. This is because it is constructed on the assumption that the household is the unit of decision making. As a result, household financial statements cannot be used to study within-household resource allocation or bargaining, although they could be used in conjunction with other information from the integrated household surveys that collect some data at the individual level such as individual labor supply. As in Chiappori, Townsend and Yamada (2008), labor supply data can be used to

back out individual-level measures of risk aversion and time preference. Then regressions with household fixed effects can be used in conjunction with the household aggregated financial accounts to test whether poor households are a collection of risk averse or risk loving individuals.

Second, financial accounting fails to measure human capital and other intangible assets. Researchers have to be cautious in using the accounts in the study of returns on assets or wealth. Also, financial accounts do not provide information on the investment into these intangible assets, i.e. on-the-job training and learning-by-doing. In addition, with the absence of human capital as assets in the balance sheet, education and health spending cannot be recorded as investment. Again, they are recorded as non-food consumption expenditure. One could envision education and health maintenance expenses as being put into a separate category in which the flows of human capital investments are measured but the underlying stocks, initially unobserved and influenced along the way by other things, are not. This approach is tempting but problematic because it disconnects the statement of cash flows from the balance sheet. Alternatively, one could follow an indirect approach used by the World Bank (2006) discussed earlier in chapter 4, which computed the value of human capital and other intangible assets as a residual of the total wealth of the household that was not accounted by its tangible assets, where total wealth was defined as the present value of household's future consumption stream. However, as we argued, this approach is subject to specific assumptions on future consumption and discount rate, potentially creating measurement errors.

Third, although the financial accounting framework helps researchers design survey questionnaire and systematically organize survey data, some of the decisions are quite arbitrary. For example, should changes in inventories be treated as a production, investment or financing activity? Are lending transactions of a moneylender treated as production (of financial services) or financing activity (as lending and borrowing in the standard financial accounts)? Should receiving contingency gifts be treated as household liabilities or household wealth? How should we treat joint-liability or guaranteed loans? How

should we depreciate fixed assets? Should the assets be valued at the acquisition cost or marked to market values? Such arbitrary decisions are however by no means specific to this monograph. The existence of the continuously revised and updated Generally Accepted Accounting Principles (GAAP) that firms and accounting auditors adopt as the general rules in corporate financial accounting reflects this tension between clarity and arbitrariness.

Finally, although information from household financial statements and simple financial ratios are useful, we still need economic models that help us formulate hypotheses when we study household behavior. For example, the accounts may tell us which households have higher rates of return on assets. Higher returns however could come from higher risks and not from higher productivity per se. In order to understand whether some households are more productive than others, we need to impose an economic model on the data and get the estimates of risk-adjusted returns as we briefly illustrate in chapter 5.

7.3. MODELING HOUSEHOLDS AS CORPORATE FIRMS

As is evident from the data, organized by the accounts, households such as these in developing countries are engaged in complicated liquidity, portfolio management, and investment strategies. It will take some time to better characterize these strategies jointly with the determination of the sources of obstacles to trade. However, the conceptualization and measurement that are embodied in the constructed financial accounts are necessary for the study of household finance: production, consumption, investment, liquidity, financing, and wealth management of these households. The conceptual framework and measurement of the monograph also have implications for modeling choices and research directions, as we now argue.

As a corporate firm, a household is comprised of a collection of assets. These assets are associated with its various production activities. Thus the first choice in economic modeling is to specify the set of assets and activities in which a household is involved, for each household separately, or abstracting somewhat, for household types. This

could be an exogenous specification in some models, though ideally it would be an endogenous choice in other more ambitious models.

However, household assets may be financed by outsiders, either via debt or gifts, so others outside the household may have contingent claims on household income streams generated from these assets. The conceptualization of gifts as equity issue, as proposed in this monograph, presents a relatively new way of modeling the gifts that are so commonly observed in developing economies. Also, the view of debt and wealth as components of household assets will allow us to draw on insights from the corporate finance literature on the capital structure of firms. Hypotheses include the debt-equity static trade-off and the pecking order of finance, for example. On the other hand, these hypotheses may be rejected in the data from households with small and medium enterprise (SME) here, so that we give back something to the finance literature. Finally, many previous studies on household consumption tend to assume that household income is exogenous. The better defined measures of consumption and income proposed in this manuscript will allow researchers to better analyze the endogeneity of occupational choice, production, investment, and income when they study household consumption behavior, and vice versa.

On the distribution of outputs produced, we view consumption as dividends. There is finance literature on dividend payout decisions, but much of it is based on maximizing discounted present value of the firm, incorporating taxes and signaling for example. We however tie shareholders' dividends to consumption of closely-held owners and thus to standard utility maximization. Consumption-based dividend policies are more likely to be prominent for the households that own a large part of the investment project, i.e. being a block majority shareholder in finance terminology. This is particularly the case for the SME households in developing economies. We can consider consumption as a motive for dividend payouts and link together consumption smoothing and investment literatures. Indeed, as we observe in corporate firms, reduced consumption (dividend cuts) can help finance investment.

Investment decisions and investment financing are at the core of corporate finance literature but less systematically considered in

development economics. Investment is of course either an increase in the stock of assets in a given activity, or associated with the starting of a new activity. Few would argue that a big piece of machinery ought to be subtracted totally, immediately, from income as a contemporary expense. These are investment decisions, consistent with the view of a household as a collection of productive assets. Inventories, including work-in-process inventories associated with the distinction between cash flow and accrued income, are conceptualized and measured here in the same spirit. But we do separate these in the accounts and keep track of investments in fixed assets, change in working capital such as inventories, as well as account payables and account receivables. Naturally, we would model working capital management as a part of an intertemporal production activity.

Although household liquidity is obviously different from household performance, these two issues are sometimes intertwined in empirical development economics. Again, we distinguish the two by looking at cash flow versus net income. Under the cash flow concept, there could be a lot of small negative entries associated with input purchases, maybe even some large ones, and occasional large positive revenues, associated with sales. Under the accrual income method, volatility is potentially lower as it is less sensitive to inconsequential timing in these transactions. So we get a better view of risk associated with productivity and of course a better view of productivity itself. Otherwise, high variation in cash flow or ill-measured income will contaminate attempts to measure idiosyncratic versus aggregate shocks, permanent shocks, and the spatial correlation of shocks, among others. Cash flow does remain important of course, especially when we consider fluctuations in required payments and liquidity issues. Although we decided to include non-cash transactions with outsiders, there are nontrivial modeling decisions here which lie at the heart of monetary economics. Put crudely, these are modeling decisions about what to put into the budget or cash flow constraint.

We treat savings as retained earnings (net income less consumption) using the accrued net income measure, not cash flow from production. Although this may seem strange, the reader may be reminded that this is exactly what is done in standard national income and product

accounts for business enterprises. It is also the basis of standard flow of funds analysis. Our framework therefore ties micro and macro data together in a natural way, crucial for modeling the microfoundations of macroeconomics. That is, the research agenda includes putting together micro-founded models of the macroeconomy. From the conceptualization of this monograph, and from our measurement, we now know that savings as retained earning is associated with complicated changes in the household's composition of assets and liabilities. Indeed, the view of households as corporate firms allows us to draw insights from the portfolio theory of finance and may help us better model and understand household asset and liability strategies as well as household diversification behavior.

There are some final important points that we would like to emphasize related to our discussion of modeling households as corporate firms, based on the financial accounts we constructed in this monograph. First, the conceptualization and construction of the financial accounts neither assume complete markets nor neoclassical decision-making. Indeed, we use the accounts to study various aspects of household behavior that deviate from standard neoclassical predictions. For example, as shown in chapter 5, household consumption smoothing is imperfect. Consumption and investment are also interdependent and not separable. These data and the accounts are being used in various ongoing research efforts that test for anomalies or deviations from neoclassical benchmarks, and thus are related to much other literature.

Second, we have discussed implicitly various possible alternatives for modeling household behavior as corporate firms, especially for those running businesses such as SMEs, drawing from the literature in corporate finance and financial accounting. Our argument is that household behavior is closely linked to financial decisions and so we hope that the corporate finance literature might provide some insights to the study of household finance. Examples include consumption, investment, financing, liquidity, risk and portfolio management. Obviously, though, our approach is not exclusive and certainly there are other ways to model the behavior of households in developing economies, based on the data from household surveys.

Some of these may be complementary to what we do or propose in this monograph.[1]

Finally, the use of the accounts in this monograph comes from the Townsend Thai Monthly Survey, but we have only begun to tap the potential of the many sections of the questionnaire, and have not yet utilized much of the data that are available. For example, the survey data contain the households' own point estimates of future crop harvests. These information and related questions might be used to help forecast future productivity or used more generally in an analysis of decision making of agricultural households. There is also information on risk responses that might inform us about risk aversion or at least how households say they respond to shocks. Such information would greatly complement to the use of the accounts in the study of household financial decisions. Similarly, we have detailed demographic information of the households that could be incorporated and used with the financial accounts.

In conclusion, we emphasize again that understanding the financial environment and financial behavior of households is crucial for developing economies. It helps researchers and policymakers evaluate existing policies targeting poverty, and potentially helps guide the removal of distortions in financial markets. To achieve this objective, we need high frequency panel data from household surveys with detailed questionnaires. Although several studies using data from this type of survey have provided important insights about the financial situation of households in developing countries, definitions and measurement of variables used in these surveys and studies are sometimes inconsistent or unclear. This monograph proposes a conceptual framework for the measurement that helps researchers define variables in such a way that they are consistent with each other and also consistent with what is implied from economic theory. We illustrate how to organize the data systematically and how to apply

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[1] For various models of agricultural households, see the edited volume by Singh, Squire and Strauss (1986), for example. The volume consists of case studies drawn from several developing countries and presents the models of multi-crop households, food consumption, subsistence households, yield risk, collective farms, and multimarket analysis of agricultural pricing policies, among others.

them to an analysis of household finance. We argue that this is the first and the most important step in enhancing our understanding of household finance in developing countries. As Lord Kelvin's dictum, inscribed on the façade of the Social Science Research Building at the University of Chicago, proclaims: *"If you cannot measure, your knowledge is meager and unsatisfactory."*

Appendix

Examples of Financial Statements

Table A.1. *Balance Sheet of Household A*

Month	5	6	7	8	9
Cash in Hand	1,966,139	1,862,121	1,701,863	1,663,257	1,593,938
Account Receivables	688,971	805,259	952,359	1,059,382	1,126,773
Deposits at Financial Institutions	167,271	167,969	168,094	156,799	157,474
ROSCA (Net Position)	33,000	37,000	41,000	11,500	16,050
Other Lending	153,136	153,136	153,136	153,136	153,136
Inventories	1,346,939	1,440,729	1,576,481	1,697,413	1,842,527
Livestock	326,280	323,018	319,787	316,590	313,424
Fixed Assets	967,342	973,759	970,949	968,151	965,365
Household Assets	598,758	596,261	593,775	591,299	588,833
Agricultural Assets	66,104	65,829	65,554	65,281	65,009
Business Assets	2,479	11,669	11,620	11,572	11,523
Land and Other Fixed Assets	300,000	300,000	300,000	300,000	300,000
Total Assets	**5,649,079**	**5,762,991**	**5,883,669**	**6,026,228**	**6,168,687**
Total Liabilities	1,132,310	1,280,270	1,425,465	1,570,660	1,715,855
Account Payables	1,078,505	1,228,465	1,375,660	1,522,855	1,670,050
Other Borrowing	53,805	51,805	49,805	47,805	45,805
Total Wealth	4,516,769	4,482,721	4,458,204	4,455,568	4,452,832
Initial Wealth	3,439,250	3,439,250	3,439,250	3,439,250	3,439,250
Cumulative Net Gifts Received	−6,664	−6,046	−6,357	−6,319	−7,576
Cumulative Savings	1,084,182	1,049,517	1,025,311	1,022,637	1,021,158
Total Liabilities and Wealth	**5,649,079**	**5,762,991**	**5,883,669**	**6,026,228**	**6,168,687**

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

10	11	12	13	14	15	16
1,504,906	1,531,443	1,484,738	1,448,589	1,407,044	1,362,112	1,311,011
1,207,075	1,269,435	1,320,273	1,373,029	1,422,880	1,473,025	1,524,025
157,469	189,549	201,194	240,759	240,304	240,249	240,194
20,600	25,150	28,450	7,750	10,750	16,750	23,750
153,136	153,136	153,136	153,136	153,136	153,136	153,136
1,986,251	2,111,673	2,238,242	2,356,958	2,486,177	2,609,586	2,744,157
310,289	313,186	310,055	336,954	333,585	330,249	326,946
962,591	959,828	957,076	954,336	951,608	948,890	946,185
586,378	583,933	581,498	579,073	576,658	574,253	571,859
64,737	64,468	64,199	63,931	63,664	63,399	63,135
11,475	11,428	11,380	11,332	11,285	11,238	11,191
300,000	300,000	300,000	300,000	300,000	300,000	300,000
6,302,317	**6,553,400**	**6,693,163**	**6,871,511**	**7,005,483**	**7,133,997**	**7,269,404**
1,861,050	2,116,245	2,260,056	2,403,867	2,547,678	2,679,744	2,827,946
1,817,245	1,964,440	2,111,635	2,258,830	2,406,025	2,541,475	2,693,525
43,805	151,805	148,421	145,037	141,653	138,269	134,421
4,441,267	4,437,155	4,433,107	4,467,644	4,457,806	4,454,253	4,441,459
3,439,250	3,439,250	3,439,250	3,439,250	3,439,250	3,439,250	3,439,250
−6,635	−7,233	−7,181	−6,774	−7,000	−6,335	−4,198
1,008,652	1,005,139	1,001,038	1,035,168	1,025,555	1,021,338	1,006,406
6,302,317	**6,553,400**	**6,693,163**	**6,871,511**	**7,005,484**	**7,133,997**	**7,269,405**

Table A.2. *Income Statement of Household A*

Month	5	6	7	8	9
Revenue from Cultivation					
Revenue from Livestock	30,485	27,753	26,180	21,780	26,730
Livestock Produce	28,985	27,753	26,180	21,780	26,730
Capital Gains	1,500				
Revenue from Fish and Shrimp					
Revenue from Business	184,360	145,360	183,875	152,890	160,455
Revenue from Labor Provision	11,440	11,440	11,440	11,440	11,440
Other Revenues	6,000	3,000	6,000	6,000	6,000
Total Revenues	**232,285**	**187,553**	**227,495**	**192,110**	**204,625**
Cost of Cultivation					
Cost of Livestock	31,944	30,281	27,642	22,813	21,715
Capital Losses					
Depreciation (Aging)	3,281	3,263	3,230	3,198	3,166
Other Expenses	28,663	27,018	24,412	19,615	18,549
Cost of Fish and Shrimp					
Cost of Business	220,176	167,323	199,933	150,300	159,472
Cost of Labor Provision					
Cost of Other Production Activities					
Total Cost of Production	**252,120**	**197,604**	**227,575**	**173,112**	**181,187**
Interest Revenue					
Interest Expense	55	55	55	75	55
Other Expenses	2,794	2,783	2,810	2,798	2,786
Depreciation of Fixed Assets	2,794	2,783	2,810	2,798	2,786
Insurance Premium					
Extraordinary Items					
Capital Gains					
Capital Losses					
Net Income	**–22,684**	**–12,889**	**–2,945**	**16,125**	**20,597**
Consumption	9,035	9,362	8,145	10,849	8,566
Savings	–31,719	–22,251	–11,090	5,276	12,031

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

10	11	12	13	14	15	16
	3,200	11,676	11,676	11,676	11,700	
28,050	39,000	39,600	79,600	39,600	33,000	31,900
28,050	33,000	39,600	39,600	39,600	33,000	31,900
	6,000		40,000			
167,295	249,440	169,460	175,855	166,170	167,150	170,000
11,440	11,440	10,056	11,440	10,096	10,100	10,000
6,000	6,000	6,000	6,000	6,000	6,000	6,000
212,785	**309,080**	**236,792**	**284,571**	**233,542**	**227,950**	**217,900**
		1,468	1,468	1,468	1,468	
19,225	20,371	25,573	27,787	30,064	28,059	27,048
3,134	3,103	3,132	3,101	3,370	3,336	3,302
16,090	17,268	22,441	24,687	26,694	24,723	23,745
173,440	262,931	182,317	186,649	173,751	174,006	177,608
					150	100
192,665	**283,302**	**209,358**	**215,905**	**205,283**	**203,684**	**204,756**
55	55	55	35	55	55	55
2,775	2,763	2,751	2,740	2,729	2,717	2,706
2,775	2,763	2,751	2,740	2,729	2,717	2,706
17,290	**22,960**	**24,627**	**65,891**	**25,475**	**21,494**	**10,383**
16,186	9,663	1,472	3,005	6,332	2,399	9,105
1,104	13,296	23,155	62,886	19,143	23,892	1,278

Table A.3. *Statement of Cash Flows of Household A*

Month	5	6	7	8
Net Income (+)	−22,684	−12,889	−2,945	16,125
Adjustments:				
Depreciation (+)	6,075	6,046	6,040	5,996
Change in Account Receivable (−)	−147,488	−116,288	−147,100	−107,023
Change in Account Payable (+)	149,960	149,960	147,195	147,195
Change in Inventory (−)	−126,465	−106,205	−148,866	−128,883
Change in Other Current Assets (−)	1,781	3,263	3,230	3,198
Consumption of Household-Produced Outputs (−)	−350	−314	−383	−373
Cash Flow from Production	−139,171	−76,427	−142,830	−63,765
Consumption Expenditure (−)	−8,685	−9,048	−7,762	−10,476
Capital Expenditure (−)	−3,281	−12,463	−3,230	−3,198
Cash Flow from Consumption and Investment	−11,966	−21,511	−10,992	−13,674
Change in Deposit at Financial Institution (−)	−8,895	−698	−125	11,295
Change in ROSCA Position (−)	−4,000	−4,000	−4,000	29,500
Lending (−)	0	0	0	0
Borrowing (+)	−2,000	−2,000	−2,000	−2,000
Net Gifts Received (+)	−710	618	−311	38
Cash Flow from Financing	−15,605	−6,080	−6,436	38,833
Change in Cash Holding (from Statement of Cash Flows)	−166,742	−104,019	−160,258	−38,606
Change in Cash Holding (from Balance Sheet)	−166,742	−104,019	−160,258	−38,606

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

9	10	11	12	13	14	15	16
20,597	17,290	22,960	24,627	65,891	25,475	21,494	10,383
5,952	5,909	5,866	5,883	5,841	6,098	6,053	6,008
−67,391	−80,302	−62,360	−50,838	−52,757	−49,851	−50,145	−51,000
147,195	147,195	147,195	147,195	147,195	147,195	135,450	152,050
−158,624	−157,334	−142,232	−153,825	−147,472	−157,975	−151,519	−150,782
3,166	3,134	−2,897	3,132	−26,899	3,370	3,336	3,303
−440	−590	−323	−396	−336	−348	−373	−205
−49,545	−64,697	−31,792	−24,221	−8,537	−26,036	−35,704	−30,243
−8,126	−15,596	−9,340	−1,076	−2,669	−5,984	−2,772	−8,900
−3,166	−3,134	−3,103	−3,132	−3,101	−3,370	−3,336	−3,302
−11,292	−18,730	−12,443	−4,208	−5,770	−9,354	−564	−12,202
−675	5	−32,080	−11,645	−39,565	455	55	55
−4,550	−4,550	−4,550	−3,300	20,700	−3,000	−6,000	−7,000
0	0	0	0	0	0	0	0
−2,000	−2,000	108,000	−3,384	−3,384	−3,384	−3,384	−3,848
−1,257	940	−598	53	406	−226	665	2,137
−8,482	−5,605	70,772	−18,276	−21,843	−6,155	−8,664	−8,656
−69,319	−89,032	26,537	−46,705	−36,149	−41,545	−44,932	−51,101
−69,319	−89,032	26,537	−46,705	−36,149	−41,545	−44,932	−51,101

Table A.4. *Balance Sheet of Household B*

Month	5	6	7	8	9
Cash in Hand	16,529	16,804	24,661	24,276	25,339
Account Receivables	0	0	0	0	0
Deposits at Financial Institutions	120	140	160	180	200
ROSCA (Net Position)	0	0	0	0	0
Other Lending	0	0	0	0	0
Inventories	3,772	5,878	444	0	0
Livestock	940	930	881	872	864
Fixed Assets	14,918	14,866	14,814	14,763	14,712
Household Assets	12,418	12,366	12,314	12,263	12,212
Agricultural Assets	0	0	0	0	0
Business Assets	0	0	0	0	0
Land and Other Fixed Assets	2,500	2,500	2,500	2,500	2,500
Total Assets	**36,278**	**38,619**	**40,960**	**40,092**	**41,114**
Total Liabilities	7,800	7,800	4,500	4,500	4,500
Account Payables	0	0	0	0	0
Other Borrowing	7,800	7,800	4,500	4,500	4,500
Total Wealth	28,478	30,819	36,460	35,592	36,614
Initial Wealth	26,580	26,580	26,580	26,580	26,580
Cumulative Net Gifts Received	410	1,319	3,494	4,015	5,785
Cumulative Savings	1,488	2,920	6,386	4,997	4,249
Total Liabilities and Wealth	**36,278**	**38,619**	**40,960**	**40,092**	**41,114**

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

10	11	12	13	14	15	16
23,673	26,507	26,645	26,405	27,846	34,133	36,610
0	0	0	0	0	0	0
220	240	260	280	300	320	340
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	350	2,478	1,238	1,418	7,540
900	891	882	813	860	812	1,403
14,661	14,610	14,560	14,510	14,459	14,410	14,360
12,161	12,110	12,060	12,010	11,959	11,910	11,860
0	0	0	0	0	0	0
0	0	0	0	0	0	0
2,500	2,500	2,500	2,500	2,500	2,500	2,500
39,454	**42,248**	**42,697**	**44,486**	**44,704**	**51,092**	**60,253**
4,500	4,500	4,500	6,140	6,140	6,560	5,640
0	0	0	0	0	0	0
4,500	4,500	4,500	6,140	6,140	6,560	5,640
34,954	37,748	38,197	38,346	38,564	44,532	54,613
26,580	26,580	26,580	26,580	26,580	26,580	26,580
5,982	9,247	10,193	12,326	13,298	14,777	12,754
2,392	1,922	1,423	−560	−1,314	3,175	15,279
39,454	**42,248**	**42,697**	**44,486**	**44,704**	**51,092**	**60,253**

Table A.5. *Income Statement of Household B*

Month	5	6	7	8
Revenue from Cultivation	110	3590	5100	130
Revenue from Livestock				
Capital Gains				
Livestock Produce				
Revenue from Fish and Shrimp	500			
Revenue from Business				
Revenue from Labor Provision				
Revenue from Other Production	160	150	160	160
Activities				
Total Revenues	770	3740	5260	290
Cost of Cultivation		800		
Cost of Livestock	313	9	49	9
Capital Losses	300		40	
Depreciation (Aging)	13	9	9	9
Other Expenses				
Cost of Fish and Shrimp	574			
Cost of Business				
Cost of Labor Provision				
Cost of Other Production Activities				
Total Cost of Production	886	809	49	9
Interest Revenue				
Interest Expense				
Other Expenses	52	52	52	51
Depreciation of Fixed Assets	52	52	52	51
Insurance Premium				
Extraordinary Items				6
Capital Gains				6
Capital Losses				
Net Income	−168	2879	5159	236
Consumption	2432	1447	1693	1856
Savings	−2600	1432	3466	−1619

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

9	10	11	12	13	14	15	16
90	160	100	110	130	330	200	9160
	45				155	40	600
	45				55	40	600
					100		
		500				70	
					960		
		300	390			7660	9800
160	160	250	250	160	150	160	180
250	365	1150	750	290	1595	8130	19740
							2660
9	9	9	9	69	8	9	8
				60			
9	9	9	9	9	8	9	8
		24				108	
						60	
							1080
9	9	33	9	69	8	177	3748
51	51	51	321	50	50	50	50
51	51	51	51	50	50	50	50
			270				
342	116	74					
342	116	74					
533	421	1140	421	171	1537	7903	15942
1290	2309	1610	919	2154	2291	3414	3839
−758	−1888	−470	−498	−1983	−754	4489	12103

Table A.6. *Statement of Cash Flows of Household B*

Month	5	6	7	8	9
Net Income (+)	−168	2879	5159	236	533
Adjustments:					
Depreciation (+)	65	61	61	60	60
Change in Account Receivable (−)	0	0	0	0	0
Change in Account Payable (+)	0	0	0	0	0
Change in Inventory (−)	1089	−2106	5424	614	0
Change in Other Current Assets (−)	313	9	49	9	9
Consumption of Household-Produced Outputs (−)	−1055	−530	−760	−940	−542
Unrealized Capital Gains and Losses (−)	0	0	0	−6	−342
Cash Flow from Production	243	313	9933	−27	−283
Consumption Expenditure (−)	−1377	−917	−933	−916	−748
Capital Expenditure (−)	−13	−9	−9	−2	334
Cash Flow from Consumption and Investment	−1390	−926	−942	−918	−415
Change in Deposit at Financial Institution (−)	−20	−20	−20	−20	−20
Change in ROSCA Position (−)	0	0	0	0	0
Lending (−)	0	0	0	0	0
Borrowing (+)	0	0	−3300	0	0
Net Gifts Received (+)	0	909	2185	581	1780
Cash Flow from Financing	−20	889	−1135	561	1760
Change in Cash Holding (from Statement of Cash Flows)	−1167	276	7856	−384	1062
Change in Cash Holding (from Balance Sheet)	−1167	276	7856	−384	1062

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

10	11	12	13	14	15	16
421	1140	421	171	1537	7903	15942
60	60	59	59	58	58	58
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	−350	−2128	255	−230	−6122
−36	9	9	69	−47	49	−592
−1180	−750	−1160	−810	−1180	−690	−1157
−116	−74	0	0	0	0	0
−851	385	−1021	−2639	623	7091	8129
−1129	−860	−241	−1344	−1111	−2724	−2682
107	65	−9	−9	−8	−9	−8
−1022	−795	−232	−1353	−1119	−2733	−2690
−20	−20	−20	−20	−20	−20	−20
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	1640	0	420	−920
227	3264	946	2133	1957	1529	−2023
207	3244	926	3753	1937	1929	−2963
−1666	2834	137	−239	1441	6287	2476
−1666	2834	137	−239	1441	6287	2476

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