

Starting from Scratch: A Multi-Modal Approach to Fully Integrated Household Financial Statements

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Abstract – Leading U.S. household financial surveys generate economically large measurement errors causing inconsistencies among U.S. household balance sheets, income statements, and cash flow statements (Samphantharak, Schuh and Townsend 2018). Some surveys produce remarkable good estimates of assets and others of income. However, these financial statements are not integrated via continuous, exact cash flows linking changes in stocks of assets and liabilities to income and expenditure flows. In contrast, corporate financial statements construct each account from common transaction ledgers with internal cross checks, such as double entry book-keeping and consistency checks for flows across accounts, a method applied to Thai households by Samphantharak and Townsend (2010). This paper proposes to obtain fully integrated household financial statements (IHFS) consistent with dynamic life-cycle models that offer economic and financial guidance to households, including small-business owners. We “start from scratch” at the individual household level using a flexible, multi-modal data program that collects comprehensive financial data from electronic transactions plus traditional survey and diary instruments, beginning with a new survey of consumer preferences for reporting financial data. Starting small, our ultimate goal is a representative sample of households with IHFS data accurate for key strata (income, wealth, demographics, ethnicity, and geography) that can be aggregated with sampling weights to produce consistent estimates of IHFS at the regional and national levels.

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1. Introduction

The best data from leading U.S. household financial surveys do a great job on what they were originally designed to measure. Yet each generate economically large measurement errors in estimates of U.S. household balance sheets, income statements, and cash flow statements (Samphantharak, Schuh and Townsend 2018). The *Survey of Consumer Finances* (SCF) provides excellent household data for balance sheets, but only some aspects of income and little for expenditures and cash flows. The Bureau of Economic Analysis (BEA) provides excellent data for income items disaggregated to the community level, but not for assets. The PSID, HRS, SIPP, and CEX all provide extensive but not comprehensive data on both assets and income. Yet when their data are used to construct estimates of U.S. household financial statements, they all exhibit sizable measurement errors that reflect inconsistencies and show that the data collection instruments are not integrated with financial statements in the manner proposed by Samphantharak and Townsend (2010). The key feature of “fully integrated” data is their ability to construct continuous, exact cash flows linking the changes in stocks of assets and liabilities to income and expenditure flows. Indeed, this challenge is the Achilles heel of efforts to use existing data—including administrative records and financial transactions data—to construct fully integrated household financial statements *ex post*.

Alternatively, this paper proposes a plan to obtain such fully integrated household financial statements (IHFS) by “starting from scratch” at the individual household level with a new multi-modal data collection program. We simply ask and answer two questions: 1) what precise data are needed to calculate IHFS? and 2) how can we best obtain the necessary data? Addressing these questions is the centerpiece of our long-run research program.

For the first question, we wish to provide financial statements such as those available for businesses that construct accounts from ledgers with internal cross checks such as double entry book-keeping and consistency in flows across accounts. Samphantharak and Townsend (2010) have done this using household survey data for Thailand, a developing economy where many households are running farm and non-farm small and medium-sized enterprises (SMEs). Building on this, we wish to develop U.S. household financial statements that are integrated not only at the individual level but also consistent with dynamic life-cycle models so as to provide

economic and financial guidance to households. Further, most U.S. households are not self-employed, nor do they operate businesses, but rather they supply labor to employers. This fact requires modified assessments of the revenues and costs that underlie the purpose of an income statement and a modified assessment of assets that includes human capital.

To answer the second question, we propose an ambitious, multi-year research program that will incorporate different modes of data collection that follow best practices in the applied economic survey field. Again, our goal is to obtain all elements of the IHFS for each household in its entirety so we can construct various financial accounts that are consistent with each other. Our proposed strategy blends the methodologies of the Townsend-Thai Monthly Survey (TTMS) described in Samphantharak and Townsend (2010) and the U.S. Survey and Diary of Consumer Payment Choice (SCPC and DCPC), described in Schuh (2018). The blended methodology will be extended to incorporate the greater breadth and enhancements found in the SCF and other leading U.S. surveys or related data sources. Samphantharak *et al* (2018) and Briglevics and Schuh (2020) demonstrate how the SCPC and DCPC produce unique and highly accurate estimates of continuous (daily) cash flows for currency, which can be extended to other assets and liabilities. Remarkably, the TTMS and DCPC produce data that are essentially the same as transactions recorded by banks or other financial institutions. However, because the TTMS and DCPC are traditional survey-based methods that are self-reported and costly, it is likely more efficient and cost-effective to collect as much electronic transactions data as possible from financial institutions. Angrisani, Kapteyn, and Samek (2020) report results of a new multi-mode technique that integrates collection of electronic financial transactions data with a traditional survey. Similarly, our proposed strategy will be a multi-modal approach that combines surveys, diaries, electronic data transfers, and other methods wherever appropriate and as necessary.

A challenge we strive to overcome is that research on measurement and collection of household financial data conclusively shows that such data are quite difficult to obtain. Survey response rates are notoriously low, privacy concerns are high, and it appears that no single method works completely for all consumers and households. Thus, as a crucial first step, we seek to develop better understanding of data collection efficiency by relying on a new

representative *Survey of Consumer Financial Reporting* (SCFR) to gauge the willingness and ability of U.S. households, including those self-employed and running small businesses, to share their financial information. This survey instrument will elicit consumer attitudes toward collection of confidential financial data including privacy concerns, respondent burden, purpose of data collection, trust in data protection, and elasticity of data provision to financial and other incentives. Using the results of this survey, we will sketch out the remaining steps of our long-term strategy. We recognize that ultimate choice of collection method may be different as we move across heterogeneous households and this is incorporated in our ultimate design.

Regarding the implementation of our data collection strategy, we plan to start small and build up to the ideal method. We will field test our strategy on relatively simple households characterized by lower income and wealth (thus simpler IHFS) and smaller numbers of household members (lower data collection burden). For sampling, we will start by using low-cost convenience sample(s) for the initial testing of the comprehensive HFS instrument(s) until the HFS instrument is complete and error-free. Our plan is to field these samples as a longitudinal panel studies in West Virginia or Appalachia, areas of particular interest due to struggles with relatively lower income and wealth, slower economic growth, industrial restructuring, and rural-urban divides. Ideally, we will use the entire household as the unit of observation to collect all of the necessary data to populate a fully integrated HFS. In the short run, we may need to experiment with units of observation defined by the head-of-household or even consumer.

Ultimately, our goal is to obtain a representative sample of households that each have IHFS data that can be aggregated exactly with sampling weights to produce estimates of IHFS at the regional and national level. This data set would enable researchers to conduct joint micro and macro analyses of household net worth dynamics and inequality of income and wealth among other important topics. Ultimate achievement of this goal will require obtaining data on the most elusive of consumers and households – those with the highest income and/or wealth. Tackling this challenge will be the final stage and may require assistance from government authorities and data. Hopefully by then the research program will have demonstrated the

feasibility of constructing fully integrated HFS and the benefit of completing the sampling for all U.S. households.

A high-level summary of our proposed project also serves as an outline for the remainder of the paper. After providing a brief overview of the measurement issues that inhibit the construction of comprehensive and fully integrated household financial statements in Section 2, the paper describes our four-part strategy. First, a basic theoretical model is developed to guide precise measurement at the individual household level (Section 3). Second, applied measures of each model variable are defined for each line item within the context of a long-run goal for IHFS with full line-item coverage and integrated accounts (Section 4). Third, a multi-modal data collection strategy is presented that aims to effectively obtain IHFS data for every unique household (Section 5). And fourth, a long-run sampling plan is proposed that starts simple and adds complexity over time, always ensuring full coverage and integration and aiming for statistical representation of the entire United States (Section 6).

2. Summary of Measurement Problems

It has long been recognized that traditional survey methods are imperfect. At a minimum, surveys that are not a census of the population have sampling error. Thus, two identical survey questionnaires implemented with different samples will produce quantitatively different aggregate estimates of the exact same economic concept. Questionnaires also differ across surveys in important ways – such as question wording and format, survey mode (paper versus online), participation and item non-response rates, and recall period – that lead to different aggregate estimates of what is intended to be the exact same economic concept. The NBER conference volume on improving measurement of consumer expenditures documents many of these issues (Carroll, Crossley, and Sabelhaus 2015).

In addition to concerns with traditional survey methods, leading U.S. household economic and financial surveys have been critiqued for their specific shortcomings. Numerous efforts have been devoted to improving the Consumer Expenditure Survey (CES) and Survey of Consumer Finances (SCF), for examples. [CITES] Add also other prominent survey reform efforts. [CITES] A recent critique of leading surveys in Samphantharak, Schuh, and Townsend

(2018), motivated by the analysis of “households as corporate firms” in Samphatharak and Townsend (2010), takes a more conceptual approach by asking whether the aggregate data generated by the leading surveys provide sufficient information to estimate comprehensive and fully integrated financial statements for U.S. households. Their answer was “no.” Of the half dozen surveys studied, none covered all the line items needed for each financial statement and all exhibited unacceptably large errors in their implied estimates of cash flows designed to integrate all financial accounts. Samphantharak *et al* argue that producing fully covered and integrated household financial accounts should be the objective of future data development efforts.

Recent decades have seen a breathtaking explosion in the collection and analysis of rich new micro datasets that improve measurement and understanding of household economic and financial decision making. The developments have been spurred by the need to do better than existing surveys and have been aided by favorable developments such as the IT revolution, new access to “big” and proprietary data sources, and other factors. These new data sources include: [DETAILS, CITES FORTHCOMING]

- Government files with confidential personal and financial data
 - Especially IRS, Social Security, and other administrative data
- Individual financial institution account and transaction records
 - Especially banks, credit card companies, investment brokers and advisors
- Personal financial management (PFM) and “account aggregator” services
 - Mint, Check, Yodlee, and European equivalents
- FinTech phone apps budgeting, payments, investment
- Employers and payroll companies
- “Big Tech” such as Google, Amazon, and the like

In sum, the list and potential for obtaining data on household economic and financial decision making is seemingly endless, and there is no lack of researchers available and able to collect and analyze them. This decentralized competition to find, obtain, and analyze every existing byte of household data and then combine the data to study household finance in unique and better ways is eminently worthwhile. We fully support it and even participate it in our own

modest ways. This movement may well eventually produce the dataset that all economist hope to have.

That said, we see some underlying presumptions, unstated for sure but possibly also hidden or subconscious, that may not hold and thus may motivate a complementary alternative approach to the journey to the ideal data set. One presumption is that every single byte of data that is needed to create fully comprehensive and integrated household financial statements *already exists* – or will quite soon – and thus all that needs to be done is to find and collect them. Note that it implies that literally every single data point for every line item for every U.S. household (and consumer) not only exists but also can be accessed for research. A second presumption is that every single data point that exists and is needed also is measured exactly correctly, both in terms of theoretical concept and numerical dollar value. A final presumption is that the collection and analyses of data can proceed efficiently and effectively without reliance on a methodological design and set of constraints like fully comprehensive and integrated household financial statements. These presumptions may be true; we certainly can't disprove them.

That said, we wonder whether the possibility that the presumptions might be incorrect, or at least perhaps overly optimistic in the short run, and thus leave open room for a valid alternative approach to construction of fully comprehensive and integrate household financial statements. We call this, "starting from scratch." That is, what if we were to start from a set of theoretically founded, realistically defined household financials and then said, "How can we obtain or construct exactly the right data we need to compile the desired household financials?" And if we could, how much would it cost and how long would it take? These questions motivate the remainder of this paper.

3. Theoretical Framework

This section describes the basic dynamic model of consumer choice that underlies and defines the construction and measurement of fully integrated household financial statements. For simplicity, we begin with a basic model that abstracts from many of the details encountered in measurement of actual U.S. consumer and household behavior but corresponds to a

surprising number of households even in the United States.³ Initially, the focus is on a household with a single adult member who earns wage income by renting labor to an external representative firm with exogenously determined hours; the household has no self-employment income or access to financial markets besides banking. Think of this as the financial-market-non-participant household with relatively low income (or wealth). This non-participation model will be used for illustrative calibration of the integrated household financial statements. Future drafts of the paper will gradually increase the complexity of the model to match the details measured in the household financial statements.

3.1. Household

The basic model assumes the household as consumer makes decisions at a discrete daily frequency, denoted by subscripts s (day) and t (month) during a representative financial planning month of 30 days. The consumer holds beginning-of-period t current assets, $a_{st} = m_{st}^c + m_{st}^d$, $s = \{1, 31, 61, \dots\}$ where superscripts c and d denote currency (bills and coins) and demand deposits, respectively, and the initial endowment of currency is $m_{1,1}^c = m_0$. Current assets here correspond to the monetary aggregate M1 and are used to pay for consumption expenditures. Deposits earn a nominal monthly interest rate, i_t^d that is fixed for 30 days. Each day s in month t , the consumer may receive exogenous income, y_{st} , and chooses consumption, c_{st} , and currency, m_{t+1}^c , to solve the following constrained dynamic optimization problem:

$$\begin{aligned} & \max_{c_{st}, m_{t+1}^c} \sum_{s=1}^{30} \beta^t U(c_{st}) \\ & s. t. \Delta m_{t+1}^c + \Delta m_{t+1}^d = i_t^d m_t^d + y_t - c_t \\ & \quad m_{t+s}^c, m_{t+s}^d \geq 0 \text{ for } s \geq 1 \\ & \quad m_{1,1}^c = m_0, \end{aligned}$$

where $y_t = \sum_{s=1}^{30} y_{st}$ and $c_t = \sum_{s=1}^{30} c_{st}$ are monthly income and consumption, and utility is $U(c_{st}) = \ln(c_{st})$ to keep the model as simple as possible.⁴ The price of the consumption good

³ Statistics on households fitting the basic model from the SCPC and SCF will be added in future drafts.

⁴ This specification of utility will lead to conflicts between theory and data at the level of daily consumer activity that needs to be addressed in future work. Concave utility induces consumption smoothing and avoidance of days with zero consumption. However, daily consumption expenditures in the Diary of Consumer Payment Choice and other transaction datasets on individual consumers reveal days with zero payments or expenditures. This tension reflects the reality ignored by low-frequency theory and data that most goods are durable at a daily frequency. For

is normalized to 1, and consumption includes both cash and deposit expenditures, $c_t = c_t^c + c_t^d$. Although there is no debt instrument (liability) in this problem, some types of demand deposit accounts allow for overdraft (debt) privileges so that $m_t^d \lesseqgtr 0$. When $m_t^d < 0$, a bank essentially is originating an unsecured personal loan (overdraft in this case) and thus may charge an origination fee for each instance and/or an interest rate spread between the deposit rate and loan rate, $i_t^{d-} > i_t^{d+}$, the net interest margin of bank revenue. This option is less common in U.S. banks than banks in other countries so we do not include it; credit cards are more common in the United States and will be added later.

Models of very high-frequency discrete data such as daily must confront some aspects of the data that are ignored in lower-frequency models. For example, income typically arrives less frequently than money is spent to fund consumption expenditures.⁵ Thus here, to begin, assume that income is monthly and paid in a lump sum at the beginning of the month by direct deposit into m_t^d , so that

$$y_{st} = \begin{cases} \bar{y} & \text{for } s = 1 \\ 0 & \text{for } 1 < s \leq 30 \end{cases}.$$

Alternative income frequencies such as semi-monthly, bi-weekly, or weekly can be accommodated later. Likewise, interest also is paid monthly by banks in a lump sum on the first day of the month based on the balance in the deposit account at the end of day $s = 1$, so that

$$i_{st}^d m_{t-1}^d = \begin{cases} \bar{i}^d & \text{for } s = 1 \\ 0 & \text{for } 1 < s \leq 30 \end{cases}.$$

In this regard, the deposit account receiving the direct deposit of income acts like a fixed-rate bond with maturity of 30 days that does not penalize withdrawals. Alternative interest compensation, like paid on the average daily balance, can be accommodated later.

The household's optimal consumption choice is standard, but the existence of two distinct monetary assets introduces some additional complications that are less standard in consumer theory but evident in recent monetary theory. In particular, the consumer must

example, households buy groceries less frequently than daily but eat food every day. In this instance, consumption in the model is the literal eating of food and not expenditures on groceries. Thus, actual consumption is continuous, but consumer expenditures are lumpy. We ignore this discrepancy for now but will address it in future work.

⁵ See papers by Shapiro, Baker, Pagel, among others. [CITES]

choose which asset to use to pay for each consumer expenditure as part of an expanded portfolio management problem that integrates the net benefits of payment choices with the expected returns from assets. Briglevics and Schuh (2020) illustrates this framework by estimating a transactions-level dynamic monetary model with heterogeneous utility from payment instruments and assets for each expenditure and shows the welfare importance of different instruments across time and expenditure dollar values. In their framework, cash flows among assets vary across expenditures daily and demonstrate the value of tracking household financial management at high frequency. Also, Fulford and Schuh (2019) offer a model with an endogenous payment choice between cash (currency or demand deposits) and credit cards that allows for convenience use or revolving of unsecured debt. Though seemingly dull, consumer payment choice is the lynchpin that connects real (consumption and household investment) and financial (portfolio allocation and friction management) decisions.

For the moment, we assume that financial management of consumption and investment decisions is costless. That is, cash withdrawals, asset transfers, and related activity involves no fees or other costs to execute. In addition, all payment choices are essentially costless (no discounts, surcharges, incentives, etc.) and all payment instruments (hence assets and liabilities) are accepted for payment by sellers. This assumption of a frictionless payment system is counterfactual, of course, and will need to be incorporated in data collection eventually, but for now it keeps the model simple so we can focus on the basic principles.

3.2. Representative firm

In the United States, most labor income comes from employment. To accommodate employment income simply in the basic model, we assume for now that a representative firm hires household labor input, $n_t = \bar{n}$, which is exogenous and fixed each month, to produce output of the consumption good, $y_t = c_t = f(\bar{n})$, and maximize profits,

$$\Pi_t = f(\bar{n}) - \bar{w}\bar{n} = 0 .$$

Under constant returns to scale all revenue is paid to labor, $y_t = \bar{w}\bar{n} = \bar{y}$; recall that the price is normalized to 1.

This production side of the model may seem trivially simple as is, but it is included for now as a placeholder for future development of several more substantive and important things.

For one thing, capital must be added to be able to explain interest rates of all maturities, which matter to households for everything from mortgages to bonds to even interest on demand deposits. The firm(s) that hire household labor also need to offer stock holdings and pay dividends to households, so households can evaluate and assess the marginal net benefits of starting a household business versus just owning stock in a publicly traded firm(s), or owning no business at all, and choose optimally among the options based on expected returns and risks.

3.3. Self-employment

In the United States, self-employment is less common than wage and salaried labor (about 20 percent of households) and has been declining steadily for decades. But it is still an important source of household income and expenses across the wage of wealth strata, and particularly high for high wealth households. Consequently, the integrated household financial statements will need to record self-employment business activity as well as labor rented to the representative firm. See De Silva and Townsend (2020) for an important step in this direction.

3.4. Plans for future model development

Clearly, the simple model described above will need to be expanded and enhanced to accommodate the many complex details of consumer choice and financial management that some households face. Many households invest in long-term investments such as bonds and stocks, although many also do not. Our dynamic expositional strategy in this paper is to illustrate our ideas as simply, clearly, and completely as possible in a basic model that can be used to construct and measure fully integrated household financial statements (“integration”). Then we will gradually add variables to the model and data collection that expand the scope of the household financial accounts (“sample coverage”). Throughout this expansion, we will be guided by the data – covering variables that are most common to all households first and then gradually adding variables that are less and less common until reaching full coverage. The remainder of this paper provides a discussion of the roadmap ahead for the process of maximizing sample coverage subject to full integration.

4. Integrated Household Financial Statements

This section describes the integrated household financial statements we propose to construct. It begins by explaining the motivation for integrated financials, and then describes a

recent application of the idea to U.S. household data. The last subsection reports a calibrated example of fully integrated household financials statements that maps directly to the theoretical model.

4.1. Motivation

Motivation for fully integrated household financial statements originated from the two-decade *Townsend Thai Monthly Survey* (TTMS) that was administered mostly in rural Thailand from 1998-2018 but also urban households in 2016-2018. See Townsend, Sakunthasathien, and Jordan (2013) for an overview of the TTMS project and the lessons learned from the experience. An essential insight from the TTMS was to treat Thai households as if they were corporate firms and to construct complete corporate financial statements applied to the households, as documented in Samphantharak and Townsend (2010). Most Thai households owned and operated a family business, usually some type of farming (crops) or agricultural-related endeavor (fish/shrimp, livestock, but also small retail or wholesale business). The application of corporate accounting was thus natural for family businesses. Rural Thai households also have relatively simple household financial management. For example, at the beginning of TTMS roughly half of rural Thai households had a bank account, much less the kinds of sophisticated asset portfolios. The liability side of the balance sheet was livelier and included some kinds of trade credit for a minority of businesses.

The creation of completely integrated financial accounts imposed key account identities to ensure all transactions measured in the data were entered properly. For example, a given transaction typically enters more than once and in multiple financial accounts, as per double entry book-keeping. Thus, net savings in the monthly income statement (net income less expenditures) must show up as an increase in real or financial assets – this is what is meant by integrated accounts. However, this identity needs to be adjusted for a number of items. First, real and financial asset values can appreciate or depreciate, so that balance sheet items can change with corresponding flows. If value changes are included as net appreciation in income flows the identity is restored, but on the other hand frequent and large asset-value changes can swamp the regular income flows of wage labor and profits that the income statement is meant to feature. Second, there may be net incoming gifts, which must add to increased wealth or

otherwise gifts need to be included as income. However, arguing against the latter treatment, corporate financial statements are intended to measure returns on real assets, as a measure of productivity, hence gifts for a firm are a bit problematic. Third, the natural accounting basis for the income (profit and loss) statement is the accrual basis, in which expenses in production are booked only when revenues are received (again, as net income from assets used in business). Thus, certain transactions such as sales as accounts receivable are counted as income, corresponding with an increase in accounts receivable as an asset on the balance sheet. The latter, as an example, is not associated with cash flow because no money changed hands.

Indeed, the statement of cash flow differs from the accrual income statement in only counting transactions in cash (currency, bank deposits): cash inflows and outflows in production, investment, consumption, and financing. This “current” account version of the income statement thus tracks changes in cash stocks from the flow of transactions and should be consistent with the measured change in cash in the balance sheet, a specific version of the earlier discussion of cross-account integration for savings. Another way to put this, change in assets in the cash flow statement is similar to the one implied by savings in the income statement, except that, in the cash flow statement, cash outflows associated with the purchase of other assets, as investments, are also included. The statement of cash flow measures the accumulation of cash as an asset, excluding other assets, but likewise the change in the former should show up and be identical to the change in that line item in the balance sheet.

A nettlesome problem in the implementation of corporate financial accounting with the TTMS data was that the measurement of currency induced errors, μ_t . TTMS tracked all cash expenditures for the household (including its business activity). Based on recorded transactions, the exact cash-flow identity holds, e.g.,

$$m_{t+1}^c = m_t^c + y_t - (c_t^c + x_t^c) + \mu_t$$

where c_t^c and x_t^c denote consumption expenditures and business expenditures made with currency. But if a household neglected to mention the use of currency for consumption, the other account identities enter with a vengeance. If consumption is understated, currency in the balance sheet is overstated. The survey team found that some Thai respondents misunderstood questions about deposits of currency into bank accounts, e.g., were not in

receipt of currency for a sale of milk as this was “deposited for them” by the dairy cooperative. Some government employees also have direct deposits. In fact, rural households hold relatively large amounts of currency as a store of value, though they typically deny this when asked directly how much currency is in the house.

On the other side of the world, Schuh and his team at the Consumer Payments Research Center of the Federal Reserve Bank of Boston from 2008-2018 were having relatively good success tracking levels and changes in currency and all types of U.S. consumer expenditures in the *Survey and Diary of Consumer Payment Choice* (SCPC and DCPC).⁶ The SCPC is an annual *recall-based* point-in-time survey administered each fall. The DCPC is a daily *recorded* diary of all consumer payments as well as holdings of domestic currency and primary checking account balances that is implemented from October 1-31 each year. In its first year (2012), the daily DCPC cash-flow identity for currency (excluding coins) was accurate within a coin rounding error of $\pm \$1$ for more than 70 percent of all roughly 7,800 consumer-days (= 2,600 consumers \times 3 consecutive diary days) and about 90 percent for a $\pm \$5$ error.⁷ In 2015-2019, the accuracy of the cash-flow identity for currency increased due to more error checking within the online survey and other data collection improvements. Equally importantly, Schuh (2018) discovered that the DCPC’s *payments* data can be used to construct a rough estimate of consumption expenditures that is a remarkably accurate estimate of U.S. personal consumption expenditures (PCE) from the national income accounts – notably better than the Consumer Expenditure Survey, which is designed to measure consumer spending.

The relative success of the DCPC as a data collection instrument is surprising because it only was designed to track consumer use of payment instruments, not consumer expenditures, nor to populate fully integrated household financial statements as urged by Samphantharak and Townsend (2010). The fortuitous focus on measuring stocks of currency stemmed solely from the fact that currency also is a payment instrument, albeit different from a check, debit card, online bill payment, or related instruments that are not inherently a monetary asset (see Tobin 1980 for more details). In short, the DCPC data – despite being a self-reported diary

⁶ The Federal Reserve Bank of Atlanta assumed management of the SCPC and DCPC in 2018, which can be found here: <https://www.frbatlanta.org/banking-and-payments/consumer-payments.aspx>.

⁷ See Briglevics and Schuh (2020) for more details about this cash-flow error for currency.

survey vulnerable to respondent and measurement error – collects data that is essentially the same as electronic transactions records from a bank checking account, except that the DCPC also tracks details of currency payments and management. While electronic transactions data can be easier and less expensive to collect (when available), the DCPC offers a high-quality alternative that can be more accessible. However, despite the addition of primary checking account balances in 2015, the DCPC collects scant information about the balance sheet. Although the SCPC collects some other types of assets and liabilities, it does so from respondent recall rather than more reliable documentation. Finally, both the SCPC and DCPC have the consumer as the unit of measurement, rather than the entire household.

In sum, each of TTMS and DCPS/SCPC has strengths and weaknesses. The idea thus emerged to begin the process of combining comprehensive integrated accounts from the TTMS with payments from the DCPC/SCPC. An illustration of this synthesis appears in the comprehensive statement of liquidity flows in Samphantharak, Schuh, and Townsend (2018) with existing data from the 2012 DCPC. The new project envisioned here embraces this vision more fully, starting from scratch with a fully integrated conceptual framework populated with data collected using survey methodologies developed previously and other techniques.

4.2. Measurement of U.S. financial statements

Samphantharak, Schuh, and Townsend (2018) measured the extent to which estimates of household financial statements from the leading U.S. surveys are integrated at the aggregate level. The study constructed an aggregate U.S. balance sheet, income statement, and cash flow statement using data from the leading U.S. household economic surveys: Panel Study on Income Dynamics (PSID), Consumer Expenditure Survey (CES), Survey of Consumer Finances (SCF), Health and Retirement Survey (HRS), and the Survey of Income and Program Participation (SIPP). Note that in these surveys the accrual basis of income account is not used, hence a stronger link between income and cash flow. Estimated U.S. household financial statements were evaluated along two criteria:

1. ***Line-item Coverage*** – the degree to which the financials produced estimates of aggregate assets, liabilities, income, and expenses; measured as the estimated U.S. total

dollar value divided by the best external estimate of the aggregate U.S. from the Flow of Funds (FOF) data.⁸

2. **Integration across Accounts** – the degree to which the financials produced estimates that were properly integrated through the cash flow statement; measured as the cash-flow error divided by lagged assets (internal error) or lagged FOF data.

The results were not particularly encouraging. While some data sets were relatively successful covering parts of the financials, no individual data set was satisfactory in covering all four aspects of the balance sheet and income statement. For example, the SCF covered more than 90 percent of the balance sheet but only half of the income statement. Regarding cash flows, internal errors, reflecting lack of integration across accounts, ranged from 13 to 37 percent and external errors, reflecting from the best population estimates, ranged from 8 to 61 percent for the points in time of each survey. While an estimate of any one item, say demand deposit accounts, may represent full (100 percent) coverage of aggregate U.S. data, less than full coverage of income or consumption can lead to debilitating errors in cash flows. The magnitudes of these cash-flow errors leave a great deal of room for incorrect conclusions about crucial economic concepts such as inequality of consumption, income and wealth. Indeed, wealth is sometimes inferred from flows and not independently measured.

Our proposal to start from scratch to obtain fully integrated household financial statements uses the financials created by Samphantharak, Schuh, and Townsend (2018) as the initial long-run goal. Tables 1a and 1b contain the balance sheet on days (months) $s = 1$ ($t = 1$) and $s = 31$ ($t = 2$); Tables 2 and 3 contain the income statement and cash flow statement, respectively. (Numbers in these tables are explained in the next subsection). The line items in each statement come from the items covered by the leading U.S. household economic surveys, so the union of survey questions/items should offer a good first pass at providing essentially complete coverage for *individual* households. Absent a census of households, complete coverage at the U.S. level will require proper sampling, of course. A key conclusion from

⁸ Coverage also was measured as the number of categories included in the survey within a component of the balance sheet (assets or liabilities) or income statement (income or expenses) without regard to the dollar values. Although this version of coverage is not necessarily relevant to the unbiased and efficient estimation of aggregate U.S. dollar values, the exclusion of a category from a survey is often a key shortcoming.

development of the DCPC was that obtaining *fully* integrated accounts, defined as exactly zero cash-flow errors, is difficult even for “M1 households” with only currency and demand deposits as assets.⁹ Thus, these proposed U.S. financials may require correction, modification, expansion, and other changes once actual data collection begins (more on this below).

Each line item in the household financial statements should be relatively self-explanatory but two features of these statements applied to households differ from standard corporate financials and merit brief explanation. First, the income statement includes “Labor Income” that represents compensation (wages and salaries plus benefits) earned from employment services rented to firms that are not owned and operated by the household. The household may hold public stock in its own employer, however. Second, the cash flow statement tracks expenditures that are directly related only to household operations – consumption for household members and investment in household capital – that are distinctly different from the business operations of a firm that is directly owned and operated by a household (e.g., sole proprietorship or self-employment). The separation of business and household operations, including the rental of labor in the marketplace, is often murky in practice as any tax professional knows. For examples, a “home office” and a “company vehicle” can be used for both business and household purposes.

In standard corporate accounting, the main purpose of an income statement is as noted to provide an accurate assessment of the details of profitability of the corporation generated during a financial reporting period and an assessment of the health of the underlying business activities that determine profitability, e.g., are projects run by the firm achieving a rate of return better than the next best alternative. This objective works for households who own and operate a business. For households renting out their labor, something similar could be envisioned. Indeed, discounted future wage earnings are a measure of human capital that should put explicitly on the balance sheet (Dejanir and Townsend 2020). This is a step towards

⁹ Accurately recording consumer holdings of currency require many fine details that only become apparent after trial and error. For example, the DCPC does not attempt to collect data on coins but some consumers have large stocks of coins in bank rolls or the large water bottles that can amount to large dollar values of notes – often much larger than average cash in wallets (around \$70). Unexpected amounts of domestic currency can appear in the DCPC due to other factors as well, such as conversion of foreign currency, returns of retail merchandise, or underground gambling winnings.

assessing the return on investments in education and on the job training. Commuting and other household expenses also are business related. One could also begin to think about health human capital that could be developed and added to provide an accurate assessment of the operation and health of the household. In any case, personal financial management requires careful cash and life-cycle planning (see Kotlikoff XXXX) that could be quantified within the income statement to reflect how well the household is maximizing utility in a manner analogous to the evaluation of firm profitability.

4.3. Calibrated model example

To illustrate the basic idea of fully integrated household financial statements, we now provide a simple calibrated example based on the basic model in Section 3. The numeric column in Tables 1-3 contains hypothetical dollar-value estimates for a single-consumer household employed in a relatively low-income job with no endowment of wealth. The rows in red indicate the variables included in the basic model.

The accounting for this household in the first month proceeds as follows. On the first day of the first month, the consumer is assumed to have an initial endowment of \$70 in assets in currency (approximate average U.S. consumer cash in wallet from the DCPC) and \$0 in demand deposits or liabilities. Later in that day, the consumer receives a direct deposit of monthly wage and salary payment of \$1,000 (annual before tax income of \$12,000), which appears in labor income on Table 2. As a result of this \$1,000 deposit, at the end of day the consumer also receives a monthly interest payment of \$2 (actually, \$1.67 based on annual non-compounded interest rate of 2.0 percent). This very low-income consumer pays no income tax, so the household net income for the month is \$1,002 (actually, \$1001.67), which also shows up as assets in the balance sheet of Table 1a.

As a low-income consumer, this one has a high marginal propensity to consume (MPC) out of net (after-tax) income of .90. Therefore, consumption of \$902 (actually, \$901.50) appears in the income statement (Table 2) as a deduction from net income and in the cash flow statement (Table 3) as a negative cash flow. This consumption spending, c_{st} , is likely spread out over the 30 days of the month, but the conventional income statement is a flow during a

financial reporting period so the financial statements only report monthly consumption, c_t .¹⁰ This spending leaves the consumer with monthly saving of \$100.17, which appears in the income statement (Table 2) and is added to the second month's balance sheet in Table 1b as an increase in demand deposits (rather than household investment). The second month's income statement does not appear in the tables but contains the same deposits of labor and interest income as in the first month. The second month's income is included in the balance sheet in Table 1b to make the cash flows exact.

This calibrated example illustrates two key principles of our proposal to start from scratch. First, the household financial statements have complete (100 percent) sample coverage of the household's economic decisions and full integration of accounts (exactly zero cash flow error). Although this very simple example lacks economic complexity, the financials are perfectly accurate reflections of consumer behavior and thus can be trusted for economic research at the micro level of the household and the aggregate of households. Second, the example provides an estimate of household net worth that is consistent over time. This consumer's net worth grew 9.3 percent during the month, an estimate that can be applied confidently to the analysis of economic growth in the standard of living or, with the addition of other another consumer (e.g., high income), of changes in inequality in wealth, income, or consumption.

Because it is so simple, the calibrated example understates the difficulty inherent in collecting data for the line items in the financials. For example, consider the complexity of collecting data on something as relatively simple as currency, which appears as a single variable in the model. Tables 1a and 1b instead show two categories of currency: government-backed and private. The DCPC has measured the former reasonably well so far, but not the latter due to challenges of obtaining data on cryptocurrencies that are held at least partly due to privacy concerns. Applied measurement of currency is even more complex. The line item "government-backed" currency doesn't distinguish between domestic or foreign, which is an

¹⁰ Note that daily financial statements can be constructed as well and can be very useful in modeling and estimating high-frequency consumer behavior. However, we only report here the standard monthly financial statement account for simplicity. Likewise, we also can construct a statement of gross inflows and outflows from accounts as in Table 9 of Samphantharak, Schuh, and Townsend (2018).

issue even for U.S. residents who live near borders (CITE Jeff Campbell paper on border shopping here). Now think about adding stock holdings, which again are only one variable in the theoretical model. In the real world, however, stocks include direct holdings through a broker, indirect through retirement accounts, trusts the household benefits from but doesn't control, and the like. This heterogeneity pertains only to ***public*** equity; private equity is large too and wasn't even included in the Samphantharak, Schuh, and Townsend (2018) statements. Furthermore, to properly evaluate the household maximization problem it is necessary to disaggregate asset holdings in investment accounts like retirement (401k, 403b, IRA, etc.) by collecting data individually for each portfolio share within the investment account, not just the total investment held by the household's broker. In fact, the relative simplicity of the line items in Tables 1-3 stems from the fact that leading U.S. household economic and financial surveys generally do not collect all data at a level of disaggregated detail that is likely to be necessary to ensure fully integrated financial statements. Measurement of both currency and stocks illustrates the important tradeoff between the parsimony required by models and the complexity of measuring real-world activity that must be bridged to obtain IHFS.

Finally, note that this calibrated example reflects a simple recording of the mix of payment instruments and assets used to authorize and settle consumption expenditures. According to DCPC data, currency payments account for roughly 30 percent of the volume of all consumer payments but only about 7 percent of the nominal value in a typical October because currency payments are much lower value on average. The financials in Tables 1-3 are consistent with this average payment behavior for consumption expenditures, although actual consumers holding only currency and demand deposit account assets likely have higher currency shares. For simplicity, we assume the consumer withdrew exactly 7 percent of consumption worth of currency from the demand deposit account without any withdrawal costs, so the ending currency balance remained at \$70. The mix of instruments and assets used to fund consumption expenditures can be calculated from the daily data as gross dollar-value flows from currency to consumption, and from demand deposits to consumption, throughout the month. If it is costly for the consumer to withdraw currency and/or the net benefit of payment for individual consumption expenditures varies across the payment value, location, or

days, then an optimal withdrawal and payment choice for each transaction is required as in Briglevics and Schuh (2020).

4.4. Strategy going forward

The preceding calibrated example is interesting and applicable for the many households with low income and simple personal financial management, thus an ideal starting point for starting from scratch. However, many other households have richer and more complex financial conditions and economic decisions that need to be measured to obtain complete coverage and integration for aggregate U.S. estimates of household financial statements. Going forward, this project will follow an iterative procedure between expanding the model for precise theoretical guidance and expanding the item coverage of the financial statements. We will follow a procedure we call “double-entry data design” (DEDD) that is analogous to double-entry bookkeeping in accounting. That is, for each additional line item measured in the IHFS, there must be a simultaneous corresponding extension of the model, and vice versa, ensuring continual harmony between theory and measurement. The key binding constraint is enforcement of full integration across accounts that yields zero cash-flow errors at all time.

5. Data Collection Methodology

We now discuss the plan to collect data pertaining to line items in the integrated household financial statements. Regardless whether the financials include only the items for the simple model in Section 3 or the entire set of line items in each of the Tables 1-3, it is necessary to devise a method for collecting the data in a manner that preserves full integration of the statements. As discussed in Sections 2 and 4, there are two general approaches being taken to acquire the desired data: 1) traditional survey methods; and 2) innovative collection of pre-existing electronic transactions data. Each approach has the pros and cons mentioned earlier, but neither is completely successful at the individual or aggregate level. Efforts to acquire comprehensive household account data from PFM applications, banking and other financial institutions, or the most extensive government data sources do not produce complete sample coverage or full integration of accounts. Innovative measurement approaches such as electronically linking bank account data to a survey for individual consumers, as in Angrisani,

Kapteyn, and Sawoop (2020), are promising but rare and have limited success – 46 percent of households agreed to link accounts and survey responses in Angrisani *et al.*

For these reasons and based on extensive experience collecting data from consumers and households, we propose to start from scratch also with respect to data collection by taking an alternative approach to the construction of comprehensive and fully integrated financial statements at the individual household level. Then, rather than choose the method of data collection *a priori* and impose it on the households from whom we wish to collect data without their input, we propose to invite their participation and elicit their conditions for doing so. With those in hand, we will design a multi-modal approach to data collection that hopefully will be more successful and lead to better coverage and integration. Central to the design of our data collection methodology will be the following principles:

- Ask for permission to collect data
- Compensate cooperation fairly and effectively
- Solicit preferences for data provision and honor them
- Give convincing reason(s) to agree to share data
- Offer financial analytical services from the data
- Respect refusal to report data or cooperate (if necessary)

To implement these principles, it will be necessary to obtain related information from consumers and households before designing the data collection strategy. Therefore, our first step in the process will be to survey consumers to obtain their perspectives on these principles.

5.1. Survey of Consumer Financial Reporting

The primary source of information about consumer and household willingness to share the data required for integrated household financial statements is a new instrument called the *Survey of Consumer Financial Reporting* (SCFR) described in Angrisani, Kapteyn, and Schuh (forthcoming). Motivation for the SCFR stems from the analysis of survey respondent recall about the number and dollar value of consumer payments in Angrisani, Kapteyn, and Schuh (2015), which examined the effects of framing (“typical” versus “specific” periods) and memory (length of time since payment) on recall outcomes. A key shortcoming of that study was the

lack of actual data on payment choices from consumers' bank accounts with which to evaluate the accuracy of the recall-based responses.

To overcome the lack of actual financial data, the SCFR will conduct randomized experiments with respondents to determine four things: 1) attitudes and experiences with providing personal financial data and concerns about its storage and security; 2) willingness to provide recorded and/or electronic data from their financial records and accounts; 3) elasticities of providing #2 with respect to financial and non-financial incentives; and 4) opportunities for building trust and cooperation through long-term relationships. The fourth item is included because of the lessons learned about the critical role of trust in the TTMS and the relative success of the *Understanding America Survey* (UAS) representative "internet panel" used to conduct repeated surveys such as the SCPC and DCPC.¹¹ The SCFR questionnaire is under development and testing is expected to begin in 2021. Oversamples of West Virginia and Appalachia will be drawn for the SCFR to give better precision for the efforts to collect data and draw samples described later.

A key objective of the SCFR is to develop an effective strategy for developing effective incentives for respondents to provide the lowest cost form of their personal financial data for the integrated financials. In principle, obtaining electronic data with financial records previously recorded by financial institutions potentially offers a much lower cost avenue for data collection. If respondents are unwilling to provide or authorize transfer of at least some of their electronic financial data, however, then it may be necessary to pay additional incentives to respondents – either direct compensation or through non-pecuniary rewards like free financial analysis of respondents' data, or both – to get them to provide sensitive data and information they decline to provide for free. In this case, the cost of electronic financial data can be much higher and there may arise cost-inflating perverse incentive effects of withholding data for incentives to navigate in data collection. On the other hand, if electronic financial data are unavailable and respondents don't respond to incentives, then it will be necessary to collect data directly from respondents using either traditional survey methods (like the SCF or SCPC) or

¹¹ For more details, see the USC Dornsife Center for Economic and Social Research (CESR) web site: <https://uasdata.usc.edu/index.php>.

respondent recording (like the DCPC or respondent data entry from financial records). Of course, this latter approach is costly because it requires compensation for at least two basic types of costs: 1) respondent fees for participating in the survey and possibly perverse incentive effects; and 2) labor costs for survey management (questionnaire design, sampling, programming and data management, data validation and error checking, etc.). The task, then, is to discern how to properly balance the costs of paying incentives to get low-cost, high-quality electronic data, on one hand, with the costs of traditional survey methodology on the other. To do so, we need detailed information about the tradeoffs to develop an optimal data collection strategy.

5.2. Evidence on Incentives for Data Collection

Consumers generally do not enjoy surveys about financial data. For example, Angrisani, Kapteyn, and Sawoop (2020) report that an end-of-year survey conducted with RAND's American Life Panel found that 59 percent of respondents ranked "economic and financial" surveys as the *least* liked type of survey, while only 10 percent found them most interesting. They also noted that financial surveys tend to take a long time. Consumers also are reticent to provide sensitive financial data due to privacy and security concerns. Clearly, collecting data on integrated financials from scratch will face these same challenges, but there is only limited hard evidence available in the literature on the effectiveness of incentives in obtaining personal financial data. It should be noted, however, that not all survey environments require incentives. Townsend, Sakunthasathien, and Jordan (2013) describe doing 20 years of TTMS without ever paying households direct compensation for participation or incentivizing cooperation when it was resisted, although they did give small gifts as tokens of appreciation on occasions like New Year's. This subsection briefly describes two experiments that provide evidence on the effectiveness of paid incentives and are guiding construction of the SCFR.

One study is Angrisani, Kapteyn, and Sawoop (2020), which invited the panel members of the *Understanding America Study* (UAS) to provide their financial information using the financial aggregator Envestnet|Yodlee (henceforth, "Yodlee") that interfaces well with banks' electronic transactions data.¹² For participating in any UAS, panelists receive \$20 for each 30

¹² For more details about Yodless, see <https://www.yodlee.com/>.

minutes of survey time. Before requesting participation, Angrisani *et al* pretested participation by asking a sample of 6,000 UAS panelists if they would be interested in participating and 60 percent responded affirmatively. Based on that expected 60-percent response rate, a sample of 1,100 respondents who also participated in the HRS was selected and invited to sign up for Yodlee so they could reduce the time and effort to provide their financial information for the HRS. Respondents were offered \$25 to sign up for Yodlee, \$5 for each financial institution included, and \$2 per institution per month in the future. The response rate for actual participation in the sample was 46 percent, or 14 percentage points below the pretest rate. If all 506 willing respondents had four financial accounts, the aggregate initial cost for this participation would be \$253,000 and the ongoing aggregate monthly (annual) cost would be \$4,808 (\$48,576), for a total first-year cost of \$301,576. By comparison, the remaining 594 respondents in aggregate would cost \$23,760 per hour for a traditional recall-based survey to collect the financial information (not including the cost of developing the questionnaire). If it required two hours per month of survey time to collect the necessary data, the aggregate annual cost would be \$570,240. In addition to being less costly, presumably the Yodlee data would be more comprehensive and accurate than what could be obtained through a traditional survey like the SCF or SCPC.

Another study is Cole, Schuh, and Stavins (2018), which matched data on credit card activity from the 2014-2016 SCPC with the conceptually equivalent Equifax data from the Federal Reserve Bank of New York's Consumer Credit Panel (CCP). To match these datasets, it was necessary to obtain permission from the SCPC respondents to conduct what is known as a "soft" credit report (does not affect credit score). In 2015, the request language was crude and did not reveal that permission would not affect credit scores, so only 34 percent of respondents agreed to allow it. In 2016, the language was improved to reassure respondents and the response rate increased to 49 percent – a significant improvement at no cost (except question revision). Respondents who initially decline the credit-pull request were offered randomized incentives between \$5 and \$20. With a \$5 incentive, the response rate increased from zero to 25 percent – a significant improvement at low cost. With a \$20 incentive, the response rate as 44 percent, indicating a positive but diminishing marginal response per \$1. The value of the

improved match varied by variable of interest according to the accuracy of the SCPC survey data relative to Equifax, which contains records reported by financial institutions and thus presumed to be more accurate than a recall-based consumer survey. Some SCPC data had a 96 percent aggregate match rate with the Equifax data, while others had as low as a 50 percent match rate.

Overall, these limited studies suggest that incentives can improve but not entirely overcome consumer resistance to providing electronic financial records. Notably, Cole *et al* reveal that some cooperation can be achieved without incentives through better survey methodology. Both studies indicate that relatively modest individual financial incentives produce statistically and economically large improvements in consumer data provision, but the aggregate costs involved with obtaining relatively modest sample sizes still can be relatively high. Nevertheless, the studies are encouraging because they suggest that it may be possible to devise a data collection strategy that introduces effective, low-cost incentives to obtain at least some electronic financial data from some respondents that could reduce the reliance on relatively more costly methods of traditional survey data collection. If the SCFR succeeds in discovering sufficient insights about consumer response elasticities to incentives, then careful incentive design and strategic planning for which variables to incentivize could reduce the total cost of data collection.

5.3. A Multi-Modal Strategy

Results of the SCFR, again being shaped by existing evidence on incentives for providing low-cost personal financial data, will provide the foundation for developing the most efficient, lowest cost data collection strategy for integrated household financial statements. It is not feasible to describe the details of the optimal data strategy until the SCFR is complete, of course. However, this subsection provides an outline of the general principles that we expect to follow in the process.

One overwhelming conclusion from research on individual consumers is that there is tremendous heterogeneity among them, so it is not surprising that this heterogeneity spills over into data collection. For this reason, we propose a multi-modal approach to obtaining the data necessary for integrated household financial statements. Following the guidance of the

SCFR, the strategy is anchored by a sequential three-step strategy as described in the prioritized steps below:

- STEP 1 – Develop long-term relationships, procedures, and trust with panel members
 - Seek, invite, and collaborate with like-minded entities (government agencies, nonprofits, community groups, etc., interested in household finance)
 - Explain the goals and importance of the project to panel recruits
 - Solicit and record questions, concerns, suggestions, and other focus group input
 - Provide rationale and reassurance for household participation in the project
- STEP 2 – Collect as much existing electronic financial data as possible.
 - Develop options for providing or authorizing collection of data
 - PFM's (Mint/Check, Yodlee, etc.)
 - Government collected data (IRS, etc.)
 - Electronic financial statements
 - Request data without incentive or compensation
 - Offer targeted incentives for authorizing or providing data
- STEP 3 – Collect remaining data using traditional survey methodology
 - Point-in-time stocks (balance sheet)
 - Surveys
 - High-frequency flows, daily (income statement)
 - Diaries, data entry from financial statements, and other recording
 - Low-frequency flows, monthly/quarterly/annual
 - Data entry from other financial records (e.g., employment)

In addition to lacking results of the SCFR, we do not have yet – but expect to learn in the process – insights about which of the planned modes of data collect will work and which do not or need to be improved. We also may discover new items and sources of information to be collected, and unforeseen ways to do so. In sum, we fully expect the data collection strategy to be dynamic, interactive, and influenced by trial and error.

6. Sample Design and Selection

The final part of starting from scratch is designing a plan to recruit a sample of households that can be used to collect data for theoretically founded IHFS. Because each new variable added to the model poses many measurement and data-collection challenges, we are proposing to start as simply as possible and ensure full line-item coverage and account integration for each household before gradually adding more financially sophisticated households later. It should be self-evident that this process will take a long time measured in years, not months or quarters, and thus great patience, which demands a clear vision. So, we start by laying out the long-run goal before walking through the steps to get there.

Ultimately, the goal of starting from scratch is to produce a sample of entire households, each with complete data populating household financial statements with full line-item coverage and integrated accounts, that is statistically representative of the United States at all key strata (e.g., income, wealth, demographics, ethnicity, and geography) so that households can be aggregated with sampling weights to produce consistent estimates of IHFS at the regional and national levels. Presumably, this goal is uncontroversial; hopefully, it is not unrealistic. The remaining specification to decide is sample size, which faces a tradeoff between funding on one hand and statistical precision plus feasible disaggregation on the other. A sample of 1,000 households can be constructed to be roughly representative at the U.S. level, but representation diminishes rapidly with even modest disaggregation. The SCPC and DCPC are annual and include about 2,500 to 3,000 consumers (not households except for single members). The SCF is triennial and includes about 5,000 to 6,000 households. The SCF is roughly an order of magnitude more expensive for one-third less frequent data than the SCPC/DCPC, but the SCF has a broader sampling unit (household) and larger sample – notably, one that includes proprietary information about U.S. households with the very highest income and wealth that are virtually impossible to sample without IRS or similar data. In any case, the sample size decision will be determined later when funding is known.

The remainder of this section describes our proposed sample design and gradual selection process in the years ahead based on three standard elements of sampling theory, which includes the following:

- Choice of sampling unit and frequency – a static process

- Choice of sampling frame – a multi-dimensional dynamic process
- Selection of samples from frames – a dynamic process repeated with each frame

Unlike traditional implementation of U.S. economic surveys and other data collection, which tends to choose a sampling frame and select a sample statically at a point in time, starting from scratch entails a dynamic process for the sampling frame that exhibits three features: 1) start small; 2) expand gradually; and 3) ensure full line-item coverage and account integration each step before moving ahead. At the end of this process, we envision having the desired nationally representative sample of households with data forming IHFS at the household level and all exactly aggregated levels.

6.1. Sampling unit and frequency

Naturally, the sampling unit is the household by the definition of an IHFS reflecting common financial conditions of all members of a household. Despite substantial sociological changes in composition and deterioration of intergenerational linkages in recent decades, the concept of “household” used in Censuses and taxation – defined as all people permanently living in one residence regardless of demographics – remains relevant and effective for survey methodology. Given the extensive nature of sociological changes over time, however, alternative definitions could apply and may become necessary to consider. For example, a household could be defined as biological family members living in different geographic locations but sharing common financial management. We will consider alternative definitions only if necessary. Each member of the household is defined as a consumer regardless of age or other factors.

The concept of a consumer who serves as the “Head of Household” used in the SCF, for example, also has changed meaning over time and can be relevant for measurement and data collection. Some data, like the SCF, are collected for the entire household (even those with multiple members) from a single head-of-household representative who provides data for all members. This data collection strategy can be more efficient and less costly than a household census of all consumers in the household because it takes less time and respondents that including all consumers in the household. However, data accuracy may deteriorate when the head-of-household reports for other consumers in the household. One example is the tracking

of currency, where the head-of-household may not be tracking or recording currency payments by all household members. This example is one of the main reasons why the SCPC and DCPC use the consumer as the sampling unit of measurement. On the other hand, if two adult members of the household jointly own the same checking account, it is inefficient and unnecessary for both members to report data about that account. For these reasons, we must collect data for all consumers in the household to obtain an IHFS, whether directly from each consumer or by cost-saving approaches such as a head-of-household respondent to be able to afford other high-priority features of the sample.

The sampling frequency also is dictated by the nature of an IHFS. By definition, financial statements are constructed for a pre-defined financial reporting period. For corporations, often the financial reporting period is defined by law, tax considerations, or generally accepted accounting principles (GAAP). For most households, however, financial statements are less often created or used in planning and decision making so there is room for discretion in choosing the frequency. Ideally, the frequency would be as high as possible, but the costs of data collection generally are proportional to the frequency, especially for flow variables such as daily consumer expenditures. To begin, we aim for monthly financial statements as described in the model and IHFS, but we may need to settle for less than 12 months of each year (e.g., quarterly or semi-annually) depending on funding. Monthly IHFS occurring at less than 12 months per year, even only once per year, can still be valuable and effective for longer run studies of consumer and household economic and financial behavior.

6.2. Sampling frame dynamics

Starting simple with respect to sampling frames means narrowing our focus in the short run to a much smaller and more manageable frame of households from which to draw samples for testing, evaluation, and development. For this purpose, we plan to narrow the sampling frame of households along two dimensions: 1) household composition and financial sophistication; and 2) geographic location. This subsection describes each dimension by which we limit the sampling frame in the short run and the dynamic processes we will follow in relaxing the frame restrictions as we move to our ultimate goal.

6.2.1. Household composition and financial sophistication

As explained in Sections 3 and 4, we propose starting with households who have a single member with relatively low levels of financial sophistication. Focusing first on single-member households makes the household and consumer essentially equivalent. Initially abstracting from multi-member households eliminates a great deal of theoretical, measurement, and data collection complications that arise from the need to model centralized versus decentralized decision making, heterogeneous agents, preference aggregation, and social welfare. On a practical level, multi-member households may entail legal and tax complications (joint versus individual financial accounts), measurement of private behaviors (individual consumer use of currency), intergenerational dynamics (relationships among children, parents, and grandparents), and other similar matters which increase the difficulty of measurement. Adding two-member households with married or long-term partners of similar age with joint financial accounts is a modest increase in complexity of household composition.

A correlated but distinct household characteristic is the degree of financial sophistication. The basic theoretical model is relatively unsophisticated, although SCF and SCPC data indicate that roughly 8-9 percent of households don't even have a checking account (but may use things other households don't, such as money orders). Another set of households have currency and a checking account, so roughly one-fifth to one-third of households fall into the category of household financial sophistication described by the basic model – a large enough sample frame to begin. Not surprisingly, financial sophistication is positively correlated with income and wealth so the low-sophistication of the household in the basic model is also low-income and low-wealth. Thus, our short-run focus is squarely on the households who are of central concern in the topic of inequality, net worth dynamics, and transitions across income and wealth classes.

[NOTE: A thorough joint empirical analysis of household composition and financial sophistication using the SCF and SCPC will be conducted and reported in future drafts.]

Based on the joint analysis of household composition and financial sophistication, we will develop a prioritized schedule of household types to add to the sampling frame over time. Priority will be given to types of households with the largest population shares to reach the broadest coverage of households as fast as possible. This strategy has the advantage of

increasing the short-run focus on households with lower income and wealth and middle income and wealth households while postponing the more complicated higher income and wealth households. Of course, this strategy has the opposing disadvantage of delaying progress toward estimation of U.S. aggregate economic and financial data because the upper end of the distributions account for disproportionately large shares of income and wealth. In the long run, however, all households will eventually enter the sampling frame.

6.2.2. Geographic location

The second dimension along which we want to limit the sampling frame in the short run is the geographic location of households. This geographic restriction is not unrelated to household composition and financial sophistication because of their correlation with income and wealth. Thus, we want to start in a geographic area that has relatively low income and wealth, hence relatively low financial sophistication, and choose single-member and two-member households.

Many diverse geographic areas in the United States have relatively low income, wealth, and financial sophistication, and all of them merit attention and research that may help improve economic development. Although a number of geographic areas would suffice, we selected Appalachia as a good candidate for the initial geographic sampling frame – and West Virginia in particular because it is the only state entirely located within Appalachia – for several reasons. First, much of Appalachia is not located in urban or heavily industrialized areas that come with more complexities associated with it. Second, the region of Appalachia in and around West Virginia has relatively lower variance in its distributions of income and wealth compared to high-income urban and suburban areas. Third, in recent years the Appalachian region has been the subject of considerable discussion and research about socio-economic developments and political debates. Finally, an author of this paper is employed at one of the leading universities in the region and this connection is expected to facilitate the research program, especially when it goes into the field.

For this last reason, the geographic sampling frame will begin in and around West Virginia University (WVU) and Morgantown, WV. With a population of about 31,000, Morgantown is the second largest city in the state and the only one of the largest cities that is

not shrinking in population. The surrounding Monongalia County that includes Morgantown has a total population of about 106,000. As a classic small college town, it is dominated by roughly 30,000 students plus university employees with some light industrial activity. Thus, the center of the geographical sampling frame is considered urban, modern, and relatively high income so that it is not entirely different from major metropolitan areas. However, as with every major city in West Virginia, only a very short car ride outside of the city is required to arrive in a simple, rural environment that can support the sample selection approach described in the next subsection.

Over time, the geographic sampling frame will be expanded gradually outside Morgantown and Monongalia County. Expansion will be first to other major West Virginia cities and their counties, then to other counties without major cities. Once the entire state is covered, we will weigh the options of moving to a full national sampling frame or continuing to expand the sampling frame to regions of Appalachia in the states surrounding West Virginia. This decision will depend on the outcome of the sample selection dynamics described next.

6.3. Sample selection dynamics

For each stage of development of the sampling frame in the short run, we will draw samples of households from the frame and implement the data collection methodology described in Section 5. The success of data collection is expected to depend heavily on interpersonal factors and relationships that are not typically found in survey methodology, such as persuading participation, building trust, ensuring privacy and security, providing financial analysis, and related efforts. For this reason, sample selection in the short run will not likely be random but rather will involve a more “hands on” and “relational” approach similar to the origins of the TTMS rather than the anonymous and detached survey construction with an intermediate survey vendor like the SCPC and DCPC. The remainder of this section briefly discusses some of the key elements of the sample selection strategy.

6.3.1. Community recruitment

The first crucial step toward obtaining a sample will be to identify and partner with various community groups that have common interests and objectives. The most obvious one in the short run is WVU, a land-grant university with a mission and desire to contribute to the

welfare of the state. A particularly important resource will be WVU students, especially those who reside in the state or region and can provide superior interface with the local communities. Examples of other organizations that may be inclined to provide assistance are the Appalachian Regional Commission (ARC), which serves 13 states, and the World Vision Appalachian social services organization, which is located in Philippi WV (about 1 hour from Morgantown). Local charities, religious organizations, and community groups will also be invited to help participate. All community groups willing to support the sample selection effort will be asked to contribute to efforts described in the rest of this subsection.

6.3.2. Focus groups

Standard focus groups will be formed and asked to assist with implementation and interpretation of work on both the SCFR and collection of IHFS data. The first set of focus groups will come from the WVU student body and university faculty and staff, particularly those connected with the Center for Financial Literacy and Education.¹³ Subsequent focus groups will be formed with this assistance of community groups.

6.3.3. Convenience samples

Convenience samples will be drawn with the assistance of the community support organizations and from among the focus groups to implement versions of the SCFR and data collection methods.

6.3.4. Development: building relationships

Participants in the early convenience samples will be invited to explore development of ongoing relationships based on the collection of IHFS data. One example of such relationships is the provision of regular IHFS by the principle investigators and project management team to the sample households for the latter's use in economic and financial decision making. For interested households, the PIs and project management team may also provide or facilitate financial analyses and literacy training.

6.4. Representative samples

Once we have completed the long and detailed process of sampling frame expansion and sample selection development, we will embark on the final stage of constructing

¹³ For more details, see <https://business.wvu.edu/research-outreach/center-for-financial-literacy-and-education>.

representative samples that can be aggregated exactly with sampling weights. The most obvious levels for consideration will be state (West Virginia and possibly contiguous states), regional (part of or the entire Appalachian region), and national (United States). The sampling frame for this stage will be a nationally representative panel of respondents who are experienced with kinds of data collection methods described here.

7. Summary and Conclusions

To be completed.....

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TO BE ADDED: Doepke, Mathias and Martin Schneider (JPE 2010?)

Table 1a

Household Financial Statements -- Balance Sheet (s=1, t=1)

(Includes month 1 interest)

ASSETS		LIABILITIES	
Total Assets	1071.67	Total Liabilities	0
Financial Assets	1071.67	Revolving Debt	0
(% of assets)		(% of liabilities)	
CURRENT ASSETS	1071.67	Checking overdraft (m [^] d < 0).....	0
Cash (<= 1 year maturity)	1071.67	Credit and charge cards.....	0
Currency (m[^]c)	70	Revolving store accounts.....	0
Government-backed	0	Non-Revolving Debt	0
Private.....	0	(% of liabilities)	
Bank accounts	1001.67	Housing.....	0
Demand deposits (m[^]d > 0)	1001.67	Mortgages for primary residence.....	0
Checking accounts.....	0	Mortgages for secondary or residence.....	0
Prepaid cards.....	0	Mortgages for investment (rental).....	0
Time deposits.....	0	HELOC/HEL.....	0
Other deposit accounts.....	0	Loans for improvement.....	0
Other current assets	0	Vehicle loans.....	0
Certificates of deposit.....	0	Education loans.....	0
Bonds.....	0	Business loans.....	0
Mutual funds/hedge funds.....	0	Investment loans (e.g. margin loans).....	0
Publicly traded equity.....	0	Unsecured personal loans.....	0
Life insurance.....	0	Loans against pension plan.....	0
LONG-TERM INVESTMENTS	0	Payday loans / pawn shops.....	0
Retirement accounts.....	0	Other loans.....	0
Annuities.....	0		
Trusts/managed investment accounts.....	0		
Loans to people outside the HH.....	0		
Other important assets.....	0		
Tangible (physical) Assets	0	Net Worth (equity)	1071.67
(% of assets)		Cumulative net gifts received	
Business.....	0	Cumulative savings	
Housing assets.....	0		
Primary residence.....	0		
Other real estate.....	0		
Vehicles.....	0		
Other nonfinancial assets.....	0		
Intangible Assets	0		
(% of assets)			
TBD.....	0		

Table 1b

Household Financial Statements -- Balance Sheet (s=31, t=2)

(Does not include month 2 interest)

ASSETS		LIABILITIES	
Total Assets	1171.84	Total Liabilities	0
Financial Assets	1171.84	Revolving Debt	0
(% of assets)		(% of liabilities)	
CURRENT ASSETS	1171.84	Checking overdraft (md < 0).....	0
Cash (<= 1 year maturity)	1171.84	Credit and charge cards.....	0
Currency (mc)	70	Revolving store accounts.....	0
Government-backed	0	Non-Revolving Debt	0
Private.....	0	(% of liabilities)	
Bank accounts	1101.84	Housing.....	0
Demand deposits (md > 0)	1101.84	Mortgages for primary residence.....	0
Checking accounts.....	0	Mortgages for secondary or residence.....	0
Prepaid cards.....	0	Mortgages for investment (rental).....	0
Time deposits.....	0	HELOC/HEL.....	0
Other deposit accounts.....	0	Loans for improvement.....	0
Other current assets	0	Vehicle loans.....	0
Certificates of deposit.....	0	Education loans.....	0
Bonds.....	0	Business loans.....	0
Mutual funds/hedge funds.....	0	Investment loans (e.g. margin loans).....	0
Publicly traded equity.....	0	Unsecured personal loans.....	0
Life insurance.....	0	Loans against pension plan.....	0
LONG-TERM INVESTMENTS	0	Payday loans / pawn shops.....	0
Retirement accounts.....	0	Other loans.....	0
Annuities.....	0		
Trusts/managed investment accounts.....	0		
Loans to people outside the HH.....	0		
Other important assets.....	0		
Tangible (physical) Assets	0	Net Worth (equity)	1171.84
(% of assets)		Cumulative net gifts received	
Business.....	0	Cumulative savings	
Housing assets.....	0		
Primary residence.....	0		
Other real estate.....	0	ADDENDUM: Growth in net worth (%)	9.3%
Vehicles.....	0		
Other nonfinancial assets.....	0		
Intangible Assets	0		
(% of assets)			
TBD.....	0		

Table 2

Household Financial Statements -- Income (sum t=1 to 31)

Income	1001.67
Labor income	1000
(% of income)	
Compensation	1000
Wages and salaries (y)	1000
Benefits	0
Professional practice or trade	0
Other labor income	0
Production income	0
(% of income)	
Business income (self-employment)	0
Rent	0
Other income	1.67
(% of income)	
Interest, dividends, etc.	1.67
Government transfer receipts	0
Other transfer receipts, from business	0
Other transfer receipts, from persons	0
All other income	0
Expenditures	0
Production Costs	0
(% of expenditures)	
Depreciation	0
Capital losses	0
Business expenses	0
Cost of labor provision	0
Cost of other production activities	0
Taxes	0
(% of expenditures)	
Employment taxes	0
Other taxes	0
Net Income	1001.67
Consumption	901.50
Paid in currency (7%)	63.11
Paid in demand deposits (93%)	838.40
Saving	100.17
Change in currency	0
Change in demand deposits	100.17

Table 3

Household Financial Statements -- Cash Flows ("Current Assets," Indirect Method)

Net Income (+)	1001.67
Adjustments:	
Depreciation (+)	0
Change in Account Receivables (-)	0
Change in Account Payables (+)	0
Change in Inventory (-)	0
Change in Other (not Cash) Current Assets (-)	0
Consumption of Household Produced Outputs (-)	0
Cash flow from production	1001.67
Consumption expenditure (-) (c)	-901.50
Paid in currency (7%)	-63.11
Paid in demand deposits (93%)	-838.40
Capital (durable goods) expenditure (-)	0
Cash flow from consumption and investment	-901.50
Transfers to/from Long-Term Investments	0
Withdrawals from IRA (+)	0
Pension Contributions (-)	0
Lending (-)	0
Borrowing (+)	0
Net Gifts Received (+)	0
Cash flow from financing	0
Change in Cash Holding (from Statement of Cash Flows)	100.17
Change in Cash Holding (from Statement of Balance Sheet)	100.17
Cash flow error	0.00