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Measuring Microenterprise Profits: Don't ask how the sausage is made

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Abstract

A large share of the World's poor is self-employed. Accurate measurement of profits from microenterprises is therefore critical for studying poverty and inequality, measuring the returns to education, and evaluating the success of microfinance programs. However, a myriad of problems plague the measurement of profits. This paper reports on a variety of different experiments conducted to better understand the importance of some of these problems, and to draw recommendations for collecting profit data. In particular, we (i) examine how far we can reconcile self-reported profits and reports of revenue minus expenses through more detailed questions; (ii) examine recall errors in sales, and report on the results of experiments which randomly allocated account books to firms; and (iii) asked firms how much firms like theirs underreport sales in surveys like ours, and had research assistants observe the firms at random times 15-16 times during a month to provide measures for comparison. We conclude that firms underreport revenues by about 30 percent, that account diaries have significant impacts on both revenues and expenses, but not on profits, and that simply asking profits provides a more accurate measure of firm profits than detailed questions on revenues and expenses.

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1. Introduction

Otto von Bismarck famously remarked that people who like sausages and laws should not see how either of them is made. Economists may wish to say the same about profit data from microenterprises in developing countries. Self-employment and household enterprises are major sources of employment in developing countries, with Vijverberg and Mead (2000) reporting that about one-half of the households sampled in the World Bank's Living Standards Measurement Surveys operate one or more non-farm enterprises. Self-employment is particularly important among the poor: as an example, Banerjee and Duflo (2007) note that 69 percent of the urban poor in Peru operate a non-agricultural business. Accurate measurement of profits from microenterprises is therefore critical for studying poverty and inequality, measuring the returns to education, evaluating the success of microfinance interventions, and many other important questions of interest. However, a myriad of potential problems plague the measurement of profits. The majority of microenterprises in developing countries do not keep financial records, making data collection generally reliant on recall. Money and goods are fungible between the business and the household. Inputs may be purchased in one period and sold in another, and production can be highly seasonal. And as with other income, individuals may be sensitive about revealing how much they earn, and concerned about the information being used for tax purposes.

In this paper we go inside the sausage factory of profit reporting and conduct experiments to measure the importance of these various problems, and to draw recommendations on how to collect profit data. We use data from two panel surveys of microenterprises conducted in Sri Lanka in 2005 and 2006. In the baseline surveys firm owners were asked directly for their profits in the last month, and also to report revenue and expenses. The correlation between reported profits and reported revenue minus expenses is only 0.2-0.3, and 30 percent of firms have negative revenue minus expenses. Vijverberg (1991) and Daniels (2001) report similar correlations in other countries. They conclude that net revenue, the sum of money from the business used by the household and money left after meeting business expenses and using some money in the household, may be the best single measure, but note that they have no rigid standard to compare this to.

We examine how far one can go towards reconciling the difference between profits and revenue-expenses through asking more detailed survey questions and through better matching of revenues with the expenses incurred to meet these revenues. We use reported markups of sales over input costs to adjust for the mis-match in the timing of the purchase of inputs and sales resulting from those inputs. We find these corrections do bring the levels of the two measures much closer to one another, and lead to a marked improvement in the correlations—to 0.61-0.73.

We next turn to the issue of recall error. We ask firms for sales data with different amounts of recall, and find firms understate revenues by about 10 to 15 percent with recall over four months compared to one month. However, there is little recall error in asking for annual sales compared to asking monthly sales at quarterly intervals. To correct for recall error we randomly allocated some firms ledger books, to keep diary records of firm revenue and expenses. Firms complied well with this over a one month period, but compliance fell over longer periods. The use of diaries led to significantly higher expenses and to higher revenues of similar magnitudes, suggesting that recall leads firms to underreport both revenue and expenses. However, the use of books did not have any sizeable or significant effect on reported profits, suggesting that they are less affected by recall errors. The use of books does not improve the correlation between reported revenue minus expenses and reported profits.

Finally we examine whether firms deliberately underreport revenues. As in the corruption literature we ask firms about firms like theirs, with the expectation that firms will answer in large part based on their own behavior. The majority of firms think that revenues are underreported, with a median level of underreporting of 30 percent. We had research assistants observe firms 15 to 16 times during a month and record transactions, and use this to estimate actual revenues for these firms. The reported revenues of firms are 31 percent lower than we estimate, confirming the level of underreporting suggested in the self-reports.

Putting the results of these various exercises together, we conclude that direct reports of profits are likely to be less noisy and more reliable than asking firms for all the details of the revenues and expenses. The reports one gets seem to give reasonable rankings across firms in terms of observed transactions, but are likely to understate the true profit levels.

The remainder of the paper is structured as follows. Section 2 describes the data and Section 3 calculates the correlations between profits and revenue minus expenses. Sections 4 and 5 adjust for unreported categories and for mismatching of revenue and expenses respectively. Section 6 examines recall errors, Section 7 describes our bookkeeping experiments, and Section 8 considers deliberate misreporting. Section 9 concludes.

2. Data

We use data from two panel surveys of Sri Lankan microenterprises, both designed by the authors and collected in 2005 and 2006. The first survey we use is the Sri Lanka Microenterprise Survey (SLMS), carried out in three Western and Southern districts of Sri Lanka: Kalutara, Galle and Matara.[1] The baseline survey was carried out in April 2005, with firms then re-interviewed at three-monthly intervals, with data from eight waves used here. A door-to-door screening survey of households was used to identify enterprises with invested capital of 100,000 Rupees (about US$1000) or less, excluding investments in land and buildings. We chose 618 enterprises in retail trade and manufacturing operated by owners aged 22 to 65, and with no paid employees. The enterprises include common self-employment activities such as running small grocery stores, selling tea, food preparation (e.g. string hoppers), sewing clothes, making lace products, and coir production. They therefore cover a range of typical small-scale activities in many developing countries.

The second survey is the Kandy Microenterprise Survey (KMS), a specialized survey taken of retail trade firms in Kandy area for the purposes of a bookkeeping and

[1] Fieldwork was carried out by ACNielsen Lanka (Pvt) Ltd. See de Mel, McKenzie and Woodruff (2007) for further details.

monitoring experiment to be described below.[2] We choose 180 retail trade firms, intended to be similar in size to the retail firms surveyed in the SLMS. A baseline survey was carried out from August 22-26, 2005, collecting July data for these firms. August data was collected in the first 10 days of September, and September data was collected throughout the month for some firms, and in the first few days of October for others. Data for 174 firms was available for all three months.

Table 1 provides summary statistics for both surveys. The firms in both surveys are quite similar in many respects, although more of the SLMS firms are operated by women. The firms have generally been in operation for some time, with a mean age of 6 years in Kandy and 10 years in the SLMS. Firm owners average 9 to 10 years of schooling, and there is near universal literacy and numeracy. However, few firms keep business records: 86 percent of firms in Kandy and 73 percent of firms in the SLMS keep no business records. Moreover, over 90 percent of firms in both surveys do not pay taxes, removing another potential source of business accounting information. Firms in Kandy are more likely to be registered with the local level administration (Pradeshiya Saba) or District Secretariat (D.S.), but this higher level of formalization still does not lead to more record keeping.

The lack of record keeping observed among these small firms suggests that reported profits may be subject to a range of different types of measurement error. The lack of record-keeping appears to be a general phenomenon among small businesses in developing countries. For example, 22 percent of Mexican microenterprises with less than US$1000 of non-land capital investment keep records, according to the 1998 ENAMIN survey.[3] Studies during the 1980s found only 17 percent of small industry owners kept records in Sierra Leone, and less than 10 percent in Jamaica and rural Bangladesh (Liedholm, 1991). It is therefore of general interest to determine what can be done to elicit reasonable information on profits from small firm owners.

[2] Fieldwork was carried out by the Kandy Consulting Group.
[3] See McKenzie and Woodruff (2006) for more details on this survey.

3. Simple measures of profits

We motivate our initial two measures of business profits on the basis of the way these questions are asked in the Mexican National Microenterprise Survey (ENAMIN), one of the more comprehensive and regular microenterprise surveys carried out in developing countries.[4] The first measure of business profits is obtained by asking the firm owner for the revenue and expenses of the firm, and then calculating profits as the difference between reported revenue and reported expenses. We asked owners for the total revenues of the firm in the last month, and then for the total expenses in each of eleven categories (purchases of inventories; purchase of electricity, water, gas and fuel; interest paid; wages and salaries for employees; rent for machinery and equipment; rent for land and buildings; telephone or cellphone charges; taxes; maintenance and general repairs; traveling expenses; and other expenses).

The second measure asks owners directly for their profits, by means of the following question, illustrated here for the month of March:

"What was the total income the business earning during the month of March after paying all expenses including the wages of employees, but not including any income you paid yourself. That is, what were the profits of your business during March?"

Table 2 reports the mean, standard deviation, median, and percentage of profits which are negative, for each of these two measures of profits for July and August in the KMS, and for the first and second rounds of the SLMS. For comparison with the KMS, we also separate the second round measurements in the SLMS into measures for retail trade and manufacturing firms. The foot of the table reports the Pearson and Spearman (rank-order) correlations between the two measures, along with a p-value for a test of independence.

[4] Less detailed versions of the same questions are also asked in the World Bank's Living Standards Measurement Surveys (see Vijverberg, 1991 and Vijverberg and Mead, 2000).

Table 2 shows that the observed correlation between directly reported profits and revenue-expenses is low, with Pearson correlations of 0.2-0.3.[5] These correlations are similar to those found in microenterprise surveys in other countries. For example, the ENAMIN survey in Mexico gives a Pearson correlation of 0.32 between profits and revenues-expenses for firms with less than US$1000 in capital stock. Vijverberg (1991) finds a correlation between revenue-expenses and reported earnings between 0.27 and 0.43 in Côte d'Ivoire and negative and close to zero in Ghana, and Daniels (2001) reports a correlation of 0.24 between these measures in Zimbabwean microenterprises.

Secondly, we see that mean and median reported profits are higher than mean and median reported revenue-expenses, while the standard deviation of revenue-expenses is three times larger than that of profits. Finally, no entrepreneur reports that his or her profits are negative, whereas over a quarter of firms have negative reported revenue-expenses. Again these findings mirror results obtained in other countries. Vijverberg (1991) finds average revenue-expenses to be negative in three out of four industries studied in Côte d'Ivoire and Ghana, with large standard deviations; Vijverberg and Mead (2000) report 20 percent of enterprises have negative revenue-expenses in household surveys in Ecuador and Pakistan, and Daniels (2001) reports 37 percent of firms have negative revenue-expenses in Zimbabwe.

Does profits or revenue-expenses provide the more realistic level of income? One indication can be found in the wages paid to entry-level workers in similar industries to those our firms operate in. Interviews with owners of firms with 5 to 45 workers in the garment, coir, lottery ticket sales, fishing, and boat-building industries revealed typical daily wages of 300-350 Rupees, leading to monthly wages of 6000-7000 Rupees. As a second indication, we asked SLMS firms what is the lowest monthly wage they would be prepared to accept to close their business and work in a wage job. The median response was 8000 Rupees. Even allowing for a premium for the flexibility of self-employment, this leads us to believe that a reasonable measure of firm profits should have average

[5] Note the correlations are lower for July in the KMS than for August. Both July and August data were asked at the start of September. We interpret the lower correlations in July as therefore arising from greater recall errors with two month compared to one month recall.

level of approximately 5000-6000 Rupees. Direct reports of profits are much closer to this than the mean and median levels of reported revenue-expenses.

The large differences in levels between these two measures of profits and their weak correlation begs the questions of "which measure is more accurate?" and of "what causes differences between the two measures?". The remainder of the paper serves to help answer these questions.

4. Adjusting for Unreported Categories

The first explanation we consider for the difference between reported revenue-expenses and reported profits is that there are categories of expenses or forms of profit which are not captured in the basic questions above. After the first round of the SLMS we re-interviewed a subset of firms with large differences between reported revenue minus expenses and reported profits, and asked them to explain the difference between the two measures. These interviews revealed four unreported categories:

(i) Business goods and materials used for home consumption, but recorded as business expenses

(ii) Firm inputs which were given as gifts by non-household members, but which were recorded as business expenses.

(iii) Firm owners who paid themselves a salary, but failed to include this when reporting profits (despite the profits question explicitly including this).

(iv) Business revenues used to pay for household expenses, but not included as profits (unreported drawings).

We then included these questions in the KMS and in the second round onwards of the SLMS. The top panel of Table 3 reports the percentage of firms that report having expenses or profits in each category. The major unreported categories reflect fungibility of resources between the business and the household. This is particularly the case in retail firms, where a majority of firms use goods from the business for home consumption, but include these as business expenses. The tendency to "dip into the till" and use business revenues to pay for household expenses is greater in the Kandy firms, but still occurs in

one in six firms in the SLMS. In contrast, inputs received as gifts and owner salaries not included in profits were not very common.

The need to include separate questions on home consumption of business goods has been noted in previous literature. However, as our baseline questionnaire, based on the Mexican ENAMIN illustrates, this is not always followed in practice. Alderman (1993, p. 198) notes that "net profits could very well be negative if the household is eating up the business's profits". The bottom panel of Table 3 examines how much difference adjusting revenue-expenses and profits for these underreported categories makes. These adjustments do decrease business expenses, thereby raising the level of revenue-expenses. In the KMS August round these adjustments raise revenue-expenses from a mean (median) of 3246 (3183) to 6242 (5900), almost doubling the level. Making these adjustments also increases the mean and median of the second round SLMS revenue-expenses by 50 percent. However, the change in the number of firms reporting negative revenue-expenses is much more modest: from 30 to 25 percent in the KMS August round and 28 to 23 percent in the SLMS round 2.

These adjustments act to close the gap between the level of revenue-expenses and the level of reported profits, and take both measures closer to the levels that outside wages and firm's reservation wages would suggest. However, these adjustments have only a slight effect on the correlation between the two measures. The Pearson (Spearman) correlation increases from 0.296 (0.143) to 0.320 (0.214) in the KMS August round, and from 0.308 (0.436) to 0.312 (0.482) for the retail firms in the second round of the SLMS. However, manufacturing firms show much less change from these adjustments, reflecting the fact that fewer households owning manufacturing firms consume goods they have produced.

5. Mismatching Input Purchases and Sales

A second major source of discrepancy between reported revenue-expenses and reported profits can lie in the timing of transactions. Firms report the amount of cash revenue received and cash expenses incurred during a month. However, inputs purchased in one

month may not be sold until another month. As Samphantharak and Townsend (2006) note, this problem becomes more acute the higher the frequency at which data are collected or the shorter the recall period asked. However, the longer the recall period, the more concerned one is about recall errors.

We asked firms how much of the inventories and raw materials purchased during a month remained unsold (and not spoilt or damaged) at the end of the month. For the average retail firm, about 80 percent of the inventories purchased during a month are sold before the end of the month, with the firm at the 75^{th} percentile selling between 87 and 97 percent, and the firm at the 25^{th} percentile selling between 67 and 73 percent. Manufacturing firms have less rapid turnover, with the median firm selling only 65 percent of the month's raw material purchases before the end of the month.

In the KMS we randomly divided firms into three groups of 60 firms each. One group had monthly data for September collected in early October. The other two groups were given simple record books for keeping track of sales and expenses. We interviewed one of these two groups every week, and the other group every two days during September. The data collected during this exercise can be used to examine how frequently retail trade firms turn over inventories. On average, 97 percent of firms purchased something as inventories within each two day period (and 99 percent within each week). Much of what was purchased was sold very quickly, with the median firm selling 59 percent of input purchases within two days and 67 percent within a week of purchase. Nevertheless, there is substantial variation across firms in the turnover of inventories, suggesting that the correlation between revenue-expenses and reported profits may be affected by differences across firms in the timing of transactions.

In the January 2007 wave of the SLMS, we asked firms how much they typically markup inputs in setting the price of the goods they sell. Specifically, we asked:

"Consider the most important item which you [sell]. If you buy Rs. 1000 worth of raw materials how much revenue will you receive from the final products that you [sell] with these raw materials on average?"[6]

We then asked the percentage of sales this item represents. The average markup on the most important item sold for all firms in the sample is 66 percent. Manufacturers report somewhat higher markups, 83 percent compared with 47 percent for retailers. We can use the reported markup for each firm to estimate the purchases of raw materials which correspond to the revenues in the given month. Specifically, [revenues / (1 + markup)] yields the inputs associated the reference month's revenues. We calculate adjusted revenues minus expenses by replacing the inputs purchased during the reference month with the inputs used to produce the revenues reported in the reference month. Table 4A shows the results of this exercise using the data from round 8 of the SLMS survey, and data from rounds 2 through 8. We show on Table 4A both the reported profits and the adjusted revenues minus expenses, as calculated in Table 3. The data shown on the table are from the sample trimmed at the 1st and 99th percentiles of adjusted profits and markup-adjusted revenues minus expenses.

Adjusting for the timing of expenses and revenues using the estimated markups significantly increases the correlation between reported profits and revenues-expenses. For the round 8 data, the Pearson (Spearman) correlation between adjusted profits and adjusted revenues-expenses is 0.36 (0.54). The correlation increases to 0.67 (0.72 for Spearman) when we use the markups to adjust revenues-expenses for timing issues. The correlations are slightly lower when we use rounds 2-8, perhaps because the markups have some seasonal component. The percentage of firms with negative profits is also much lower once we account for the mismatch in the timing of purchases and sales. Only 9 percent of firms now have negative profits, compared with 21 percent before adjusting for timing mismatches. Timing mismatches thus appear to be a major reason firms show negative revenues-expenses.

[6]For manufacturers, the question was worded in terms of good manufactured rather than sold.

Table 4A reports data from round 8 of our survey, using information on the markup of the firm's main product. We also gathered markup data in round 7. In both rounds, we asked about markups on two goods: those representing the highest and second highest percentage of sales. The results using the round 7 data and the results using the average of the markups of the two main products (weighted by the percentage of sales represented by each product in round 8) are similar to those reported on Table 4A. For retailers, there is a very high correlation between the markups in the two periods (0.78) and the markups of the two goods (0.80, on average). For manufacturers, these correlations are much lower. The correlation in the markup across periods for the manufacturers is 0.28, and the correlation across the two most important goods is 0.25, on average. The lower correlations may be caused by changes in the mix of products sold by a manufacturer or by the seasonality of pricing. The data suggest that asking for markups which are specific to the survey reference period is important in the case of manufacturers.

Table 4B shows that the markup adjustment is most important for firms whose inventories turn over slowly—that is, those with a greater mismatch in the timing of revenues associated with expenses. The median firm in our sample reports that 67 percent of the inputs purchased in the reference month were sold as final goods before the end of the month. For retailers, the median percentage of inputs sold is 74 percent; for manufacturers, 65 percent. Table 4B shows that the Pearson (Spearman) correlation between adjusted profits and adjusted revenues minus expenses is 0.70 (0.77) for firms selling 75 percent or more of purchased inputs in the same month (40 percent of the sample). Adjusting for markups makes little difference for these firms. The Pearson and Spearman correlations are nearly identical, 0.70 and 0.74, respectively. The table reveals a very different story for firms with a slower turnover in inventory. Among firms with selling 60 percent or less of the month's input purchases in the month (also 40 percent of the sample), the Pearson correlation between adjusted profits and adjusted revenues-expenses is only 0.14. Using markups to adjust for timing increases this correlation to 0.66, or nearly the same level obtained by either method for firms with fast turnover of inventories. Thus, table 4B helps isolate the circumstances under which using markups provides a significant increase in the matching of reported revenues, expenses and profits.

Ideally, we would always have monthly data on revenues, expenses, and inventory levels which would allow for a more exact correction of the timing mismatches. But gathering data every month is expensive, both for the researcher and for the respondent. We experimented with two ways of asking more directly for the input purchases associated with the current month's sales within the context of the quarterly SLMS survey. Both of these alternative methods increased the correlation between profits and revenues-expenses, but not by as much as the markup method we have just discussed. The first alternative was to ask the rupee amount of inputs purchased in the reference month and used to produce goods sold in that same month, and then to ask for the rupee amount of inputs purchased in prior months which were used to produce goods sold in the reference month. For example, in the January 2007 survey, we asked for inputs purchased in December which were sold in December, and for inputs purchased prior to December which were used in goods sold in December. Added together, these represent the inputs associated with the reference month's sales—that is, the cost of goods sold for the reference month. When we use these in place of the inputs purchased during the reference month, we find the correlation between profits and adjusted revenues minus expenses increases from around 0.26 to around 0.48 among manufacturers, and from 0.35 to 0.41 among retailers.[7]

We also attempted to obtain estimates of the level of inventories held as raw materials or finished goods at the end of each calendar month. In the January, 2007 survey, we asked firms their level of inventories at the end of November and the end of December. We also asked firms what the level of inventories they expected to have at the end of January. We can calculate December's cost of goods sold by subtracting the change in inventories during the month from the purchase of inputs in the month. That is, if the firm purchased 100 rupees of inputs in December, and inventories increased by 10 rupees between the end of November and the end of December, then the cost of goods sold in December is 90 rupees. We found that firms had a difficult time reporting on the level of inventories at

[7] These data are from round 8 of the SLMS survey. We first asked these questions in the round 7 survey. As with the round 8 data, adjusting for the estimated cost of goods sold increases the correlations moderately, from 0.48 to 0.61 for manufacturers and from 0.51 to 0.65 for retailers.

the end of November and December. The non-response rates were relatively high: about 13 percent of firms failed to report a November inventory level, and 10 percent failed to report a December inventory level. Among the firms reporting data, these data increased the correlation between reported profits and adjusted revenues minus expenses from 0.26 to 0.42 for manufacturers, but has almost no effect for retailers, where the correlation falls slightly from 0.35 to 0.34.

In sum, the mismatch between purchase of inputs and the sales of goods associated with those purchases is a major cause of the differences between reported profits and revenues-expenses. When we use data on the markups over inputs costs, we find very significant improvements in the correlations between these two reported measures. Gathering information on the markup of inputs appears to be an effective way of adjusting for timing mismatches. Direct methods of asking for inputs associated with a given month's sales do not do as well. The direct methods appear to work better for manufacturers than for retail firms. The markup question is applicable even in cross sectional surveys. After making adjustments for the mixing of household and enterprise accounts, and for timing mismatches, we find a very high correlation between reported and calculated profits. We should note also that raw materials represent the vast majority of variable costs in the enterprises from which our data are gathered. In larger enterprises with more paid employees, timing mismatches for labor and other variable costs will also need to be accounted for. We believe measuring markups has promise in these adjustments as well, though our data do not allow us to confirm this.

Do reported profits move with reported sales?

It appears reasonable that firm owners have a good general idea of the level of their profits, since this forms the basis for household consumption and for any reinvestments in the business. However, in many applications one is also interested in the dynamics of profits. One would therefore like to know whether (a) reported profits respond to interventions; and (b) whether reported profits reflect the seasonality present in sales. Evidence that reported profits respond to interventions is seen in de Mel, McKenzie and Woodruff (2007), who show that a randomized experiment which increased the capital

stock of some firms led to increases in profits. To test (b), we use the 8 waves of the SLMS to regress reported profits on reported sales, firm fixed effects, and period fixed effects. The coefficient on reported sales is 0.130, with a t-statistic of 9.55. Hence reported profits are strongly responsive to periods of stronger sales for individual firms, providing evidence that reported profits are also useful for studying dynamics.

6. How important are recall errors?

The fact that few microenterprises keep formal business records means that surveys usually must rely on recall to collect business revenue and profit data. Relatively few studies have tried to measure the accuracy of this recall. However, the results of two small studies (summarized in Liedholm, 1991) carried out on 81 entrepreneurs in Honduras and 80 entrepreneurs in Jamaica from 1979-80 give cause for concern. Each study collected data twice-weekly from firms for one year, and then at the end of the period asked them for their best estimate of sales, costs, and profits for the one-year period. In Honduras, mean sales from the one-year recall were 85 percent higher than those derived from twice-weekly visits, and only one-quarter of responses were within 25 percent of the enumerated values. In Jamaica, forty-five percent of respondents said they could not recall annual sales, and mean sales were underestimated by 20 percent for those who did offer a response.

Our analysis of firms in Sri Lanka offers suggests recall error for sales is important, but not as severe as these studies suggest. In the SLMS we asked March 2005 sales from firms in the April 2005 baseline survey, and then asked month by month sales for the first six months of 2005 in the second round in July 2005. Table 5 compares the distributions of the two reports of March 2005 sales, and Figure 1 plots log March sales in round 1 against log sales for the same month reported in round 2. One quarter of firms did not report March sales when asked in the second round. For the 428 firms reporting sales in both rounds, the mean (median) sales are 10 percent (16 percent) lower when asked the second time. The Pearson correlation between the two measures is 0.491, with a Spearman correlation of 0.65. These results therefore suggest recall error is important, providing a reason to keep the recall period at a month rather than for longer periods.

However, we also find that recall is not much different over 12 months compared to the sum of monthly data collected four times during the year. In the fifth round of the SLMS, in April 2006, we asked firms for their sales over the previous 12 month period (from 1 April 2005 through 31 March 2006). We then compare this to the total 12 month sales computed from the quarterly surveys. Each quarterly survey asks sales for each of the previous three months (recall of one, two and three months). Figure 2 shows the two measures are very close to one another, with a Pearson (Spearman) correlation of 0.763 (0.841). Mean sales are only 3 percent lower with annual recall than with the quarterly reports. This suggests that while some precision is lost in going from monthly to longer recall periods, firm owners can give quite consistent recall of annual sales.

7. Bookkeeping Experiments

One obvious solution to recall problems, fungibility issues, and mismatching of expenses and revenues is to try and get microenterprise owners to keep better records. This approach has long been a staple of household consumption surveys, with some surveys asking households to keep diaries of all expenditures during a set period. Deaton and Grosh (2000) summarize several studies of this nature, including experiments comparing diaries to recall. The use of diaries was found to increase food expenditure by 46 percent in Latvia and 33 percent in Armenia compared to recall, with more mixed results for non-food items. However, Deaton and Grosh note that there is evidence that the rate of reporting declines over time, with more reported in the first week of a two-week diary than in the second week.

However, to our knowledge, the diary approach has not been pursued experimentally with firms. We therefore set out in both the KMS and SLMS surveys to see how the use of simple ledgers can improve the collection of data from small enterprises. We designed simple ledgers for firms, with five columns to be filled out:

(a) Expenses on goods and raw materials
(b) Other expenses
(c) Goods taken from the enterprise for household use

(d) Total Business Revenue

(e) Business income used to pay household expenses

We randomly assigned some firms to receive books, and others as control firms. Firms receiving books were asked to record daily amounts in each of the five columns, and were given clocks or umbrellas as small incentives for participating in the bookkeeping.

In Kandy we randomly allocated firms into three groups, each of 60 firms. The first group was re-interviewed in early October and asked about September sales, expenses and profits. The second and third groups were given the ledger books. The second group were then given weekly interviews, and the third group were given interviews every two days. Compliance with the bookkeeping was extremely high, and 71 percent of firms said they planned to continue maintaining the books after the experiment was over. Unannounced visits to the firms in November 2005, one month after we had thanked them for participating in the experiment, found 52 percent were still keeping the books of their own volition.

In the SLMS we randomly allocated half of the firms to receive the books when the second round of the survey was collected. Firms were then given new books during the third and fourth round surveys, in sum receiving books for 9 months. This is much longer than the typical expenditure diary, which asks for two-weeks, or at most one month's expenditure. In contrast to the Kandy experiment, in which data were collected from the books weekly or at two-day intervals, in the SLMS book data were collected alongside the regular survey, every three months. The increased time between giving out the books and checking that they were being maintained, along with the longer time for which they were given, resulted in less compliance with the book treatment. 68 percent of firms given books had recorded data in them for the first month (July 2005), falling to 53 percent by the third month for which books were given. The first round of data collection from the books then increased use of the books in October 2005, up to 69 percent, with use falling to 57 percent by December 2005. The January interview did not lead to any

increase in book use, and book use continued to fall, until only 43 percent recorded information in March 2006, the last full month for which books were kept.

We then estimate the effect of keeping books on reported revenues, materials purchases, total expenses, revenue-expenses, home consumed goods, and profits. We do this for the subsample of firms not keeping books in the baseline survey (for whom the treatment would therefore be a change of status). Table 6 presents the resulting estimates. Bookkeeping is found to have a significant effect in the KMS, where books were kept for the relatively short period of one month and compliance was high. Purchases of materials and items for resale and total expenses were both 7000 Rupees higher with books, a statistically significant difference which is approximately 22 percent of the mean levels for those without books. The value of goods used in home consumption was also significantly higher, with the treatment effect equal to 28 percent of the mean level of those without books. Reported revenues were 5400 Rupees higher (14 percent at the mean), but the difference was not statistically significant. Profits were only 379 Rupees higher with books (8 percent of the mean), a statistically insignificant difference.

The allocation of books results in more modest and insignificant reported intent-to-treat estimates in the SLMS. However, while the KMS had 100 percent compliance with the book treatment, compliance was less frequent in the SLMS. We therefore also present the effect of the books treatment on those who take up the books (TOT estimates), using the assignment of books as an instrument for whether books are actually used. This does increase the magnitudes of the reported effects, although they remain insignificant. However, the signs and magnitudes again suggest that both revenue and expenses are underreported without books, with less overall effect on profits.

These bookkeeping exercises therefore suggest that both revenues and expenses are underreported when records are not kept. However, reported profits don't change significantly when books are used, suggesting that recall and other such problems are not having major effects on profits. Table 7 shows that the use of books does not help increase the correlation between reported revenue-expenses and reported profits: In the

KMS those without books have higher correlations between the two measures, while in the SLMS the Pearson correlations are very close to one another, and the Spearman correlations slightly larger with books.

We interpret the changes in reporting arising from the bookkeeping experiments as due to better measurement, rather than to the books themselves improving the profitability of the business. There are several reasons to believe this. First, the books affect expenses and goods used in home consumption most – the categories we think recall errors are likely largest for – and profits least. Second, the most significant results occur in the Kandy data, over one month, whereas we would expect any direct effect of bookkeeping on business profits to take some months to arise. Nevertheless, as a further check, we revisited the Kandy firms one year later, and collected sales and profits data for August and September 2006. This allows us to check whether annual sales or profits growth is higher for firms which received the book treatment. We find no statistically significant effect of books on annual profits or sales growth, with the point estimates suggesting, if anything, lower growth for those assigned books. This acts as further evidence that the books are not themselves increasing firm profitability.[8]

8. Deliberate misreporting

Issues such as recall problems, fungibility with the household, and mismatching of purchases and sales can all be resolved to some degree through questionnaire design. However, a final cause for concern is the tendency of business owners to deliberately misreport revenue and expenses. As with corruption, it is difficult to directly ask firm owners whether they do this. We therefore followed a common approach in the corruption literature and asked firms to consider other enterprises similar in all respects to theirs, and asked "in your opinion, when providing information about expenses in surveys such as this, do enterprise owners tend to over-state expenses, under-state expenses, or state expenses correctly". We asked similar questions for revenues.

[8] This is not to say that business training, of which bookkeeping training may be an important part, may be successful in raising profits. Our analysis suggests that merely providing the books, without any business training, has no effect.

Table 8 summarizes the firm responses. Approximately half of all firms believe firms would overstate expenses, while a small minority believes firms understate expenses. Most firms think firms like theirs understate revenues: 86 percent of firms in Kandy and 60 percent of firms in the south and west believe this. We then asked firms open-ended questions as to why they think firms overstate expenses and understate revenues. The principal reason mentioned was fear of taxes, which was seen as especially a reason for understating revenues. Approximately 10 percent of firms also gave fear of robbery, lack of trust in the interviewer, and the anticipation of some financial benefit as reasons for understating income.

We then asked all firms how much they thought firms like theirs would report if true revenue and true expenses were 10,000 Rupees. Table 9 summarizes the distribution of the results. In Kandy the median firm thought firms like theirs would overstate expenses by 20 percent and understate revenues by 30 percent. In the SLMS the median firm believed firms like theirs would correctly report expenses, but would understate revenue by 20 percent.

We obtain a more objective measure of underreporting from the sample of firms in Kandy which was interviewed every two days. The research assistants conducting the interviews visited these firms 15 to 16 times during September. Though the interview was short, they were instructed to extend the visit and record the number and value of transactions occurring while they were on the premises. The visits averaged 35 minutes, and were made at different times throughout the day, from 8am to 7pm, and different days of the week. In total each firm was observed for approximately 7 to 9 hours during the month. We divide the total value of transactions observed by the number of hours the firm was observed for to obtain an estimate of average hourly revenue for the firm. We then multiply this by four times the number of hours the owner reports that he or she works per week to obtain an estimate of September revenues.[9] Table 10 compares this to the revenues reported by the same firms for September. Mean (median) reported revenues

[9] The average firm was closed for 2 days during the month, so we base our calculations on 28 days rather than 30.

are 31 (32) percent lower than mean estimated revenues based on our observed transactions and reported hours.

The implied level of underreporting of sales based on our direct observations of firms therefore accords very closely with the average level of underreporting that firms say firms like theirs do. It therefore seems reasonable to conclude that revenues are likely to be deliberately understated by firms. Nevertheless, when we adjust the revenue for each firm by the extent which it reports that firms like itself misreport, we find that both the Pearson and Spearman correlations between reported and estimated revenues are 0.66. This suggests that reported revenues still are providing reasonable information as to the scale of firm activities, just that most firms are understating this scale.

9. Conclusions and Discussion

Few small firms keep business accounts in developing countries, yet data on the profits from such businesses is crucial for answering many important economic questions. We began this paper by showing that there is a very low correlation between what firms report as profits, and what they report as revenue-expenses. We show that a large part of these differences can be reconciled through adjusting revenue-expenses for business goods used for home consumption, and for mismatching of revenues with the expenses incurred to produce those revenues. Asking questions on mark-up can be done easily in cross-sectional surveys and provides a practical method to adjust for differences in the timing of inputs and sales of outputs. Smaller adjustments in profits occur when we also account for unreported drawings in the form of business revenues being used to pay for household expenses.

We then turned to the issue of recall errors. Monthly sales are understated when recalled after four months compared to one month. However, there is little recall error associated with annual sales compared to quarterly collection of monthly sales. We experimented with giving firms diaries to record daily revenue and expenses. The use of diaries increased both reported revenue and expenses, suggesting that recall errors are present in

both. However, diaries did not have any significant effect on revenue-expenses or reported profits, nor did they improve the correlation between the two measures.

Finally we considered the issue of deliberate underreporting. Both the self-reports of firms about firms like theirs, and direct observations of transactions suggest that firms underreport revenues by around 30 percent. It seems reasonable to believe that a similar degree of underreporting also occurs with profits.

We draw two main conclusions from this exercise. The first is that asking firm owners directly for their profits (including using business revenues used to pay household expenses) seems to give a more reasonable measure than asking for all the ingredients in terms of detailed revenue and expenses. As with our opening analogy, sometimes you should just ask for the sausage and not ask how it is made. However, the level of underreporting we observe suggests that one should still be a cautious consumer.

Finally, we note that carefully asking more detailed questions about revenue, expenses, mark-ups, and household uses can also provide an accurate measure of profits, and in many applications, one is also interested in these sub-components. Furthermore, it may be that aggregating detailed individual questions is more accurate than asking about the aggregate for measuring other elements of a firm's production function, such as capital stock.[10] Therefore, there is still a case for detailed household enterprise modules in multi-purpose surveys. Our results just show that directly eliciting profits can provide useful information when this is the prime object of interest.

[10] Deaton and Grosh (2000) also suggest that asking more detailed questions (up to a point) leads to more accurate consumption aggregates. Several reasons for this are somewhat analogous to our discussions, such as the need to adjust for durable expenditure, and for consumption of non-market items. One difference between firm profits and consumption is that consumption smoothing can allow a good picture of consumption to be gathered in as short as one to two weeks of detailed information, whereas longer periods are needed to provide an accurate representation of microenterprise profitability. Our experiment with books suggests owners are unlikely to maintain account books over a long period of time, so in practice one must either rely on recall of a large number of sales and expense items over a long period, or a picture of the microenterprise collapsed into a single profit measure.

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Table 1: Summary Statistics

	KMS		SLMS	
	Mean	**Std. dev**	**Mean**	**Std. dev**
Percent Male	71.1		50.6	
Age	43.1	12.5	41.8	11.2
Years of schooling	10.4	2.4	9.3	2.9
Percent Married	85.6		81.3	
Age of business in years	6.0	7.0	10.8	10.6
Usual hours per week working in business	77.2	18.9	56.6	19.3
Percent that doesn't keep business records	85.6		73.3	
Percent registered with the D.S. office	30.6		7.9	
Percent registered with the Pradeshya Saba	60.0		12.1	
Percent registered with the Provincial Govt.	1.7		3.7	
Percent registered with the Central Govt	1.7		0.8	
Percent registered with the Business Chamber	0.0		0.6	
Percent unregistered with any entity	18.9		76.6	
Percent in retail trade	100.0		49.6	
Percent in manufacturing	0.0		50.4	
Baseline values				
Market value of inventories	24493	18000	12308	16982
Value of non-land capital stock owned	13154	13720	27447	28414
Total reported revenues - retail	28007	25028	15389	17612
Total reported revenues - manufacturing			7541	10550
Total reported profits - retail	5201	4302	4020	3266
Total reported profits - manufacturing			3390	3890
Percent not paying taxes (baseline)	92.8		96.1	
Sample Size	**174**		**619**	

Note:
Baseline is July 2005 for KMS, March 2005 for SLMS.

Table 2: Reported Profits Vs Reported Revenue Minus Expenses

		KMS		SLMS			
		July	Aug	round 1	round 2	retail	manufacturing
Reported Profits	Mean	5126	5012	3705	4690	5611	3743
	S.D.	4313	3560	3602	4435	4707	3925
	Median	3875	4000	3000	3500	4500	2550
	% negative	0	0	0	0	0	0
Reported Revenue Minus Expenses	Mean	1091	3246	1354	1958	3006	903
	S.D.	12347	12006	11516	9738	11367	7636
	Median	125	3183	1000	1661	2595	1130
	% negative	48	30	29	28	28	27
Correlations:	Pearson	0.150	0.296	0.209	0.285	0.308	0.207
	Spearman	0.021	0.143	0.329	0.422	0.436	0.411
	p-value	0.784	0.061	0.000	0.000	0.000	0.000

Note: SLMS retail and manufacturing breakdown is for round 2

Table 3: Adjusting for Unreported Categories

		KMS		SLMS		
		July	Aug	round 2	retail	manufacturing
Percentage of firms reporting that:						
Goods used for home consumption		75.9	90.8	39.2	63.5	14.7
Firm inputs given as gifts but reported as a business expense		2.9	2.3	2.3	2.3	2.3
Firm owners pay themselves a salary but fail to include this as profits:		2.9	2.3	1.2	0.7	1.7
Business revenue is used to pay household expenses, but is not counted as profit		37.4	50.6	13.7	13.3	14.1
Adjusting Expenses and Profits						
Adjusted Profits	Mean	6465	6060	5268	6180	4332
	S.D.	5251	3947	5060	5384	4526
	Median	5000	5000	4000	5000	3000
	% negative	0	0	0	0	0
Adjusted Revenue Minus Expenses	Mean	3845	6242	3399	5085	1666
	S.D.	12741	12750	11008	12312	9188
	Median	2500	5900	2150	3875	1500
	% negative	34	25	23	23	26
Correlations:	Pearson	0.136	0.320	0.295	0.312	0.216
	Spearman	0.110	0.214	0.456	0.482	0.409
	p-value	0.149	0.005	0.000	0.000	0.000

Notes: adjustments were not asked in SLMS round 1
SLMS retail and manufacturing breakdown is for round 2

Table 4A: Adjustments Using Markups

			SLMS		
		round 8	rounds 2-8	retail	manufacturing
Adjusted Profits	Mean	7334	6322	8508	6214
	S.D.	5956	5433	6044	5659
	Median	6000	5000	7000	5000
	% negative	0	0	0	0
Adjusted Revenue Minus Expenses	Mean	5368	4582	7431	3401
	S.D.	16143	13412	20967	9110
	Median	3700	2850	5775	2100
	% negative	21	23	21	20
Markup-Adjusted Revenue Minus Expenses	Mean	5543	4935	7227	3938
	S.D.	6213	5847	6859	5039
	Median	4000	3127	5540	2188
	% negative	9	8	8	9
Correlations: Adjusted Profits vs. Adjusted Rev-Exp	Pearson	0.362	0.329	0.363	0.383
	Spearman	0.541	0.519	0.538	0.513
	p-value	0.000	0.000	0.000	0.000
Correlations: Adjusted Profits vs. Markup Adjusted	Pearson	0.673	0.646	0.609	0.733
	Spearman	0.718	0.692	0.677	0.724
	p-value	0.000	0.000	0.000	0.000

SLMS retail and manufacturing breakdown is for round 8

Table 4B: Markups and Inventory Turns

		> 75% of inventories sold in same month	< 60% of inventories sold in same month
Correlations: Adjusted Profits vs. Adjusted Rev-Exp	Pearson	0.698	0.138
	Spearman	0.767	0.296
	p-value	0.000	0.000
Correlations: Adjusted Profits vs. Markup Adjusted	Pearson	0.702	0.659
	Spearman	0.742	0.697
	p-value	0.000	0.000

Table 5: How important are recall errors?

					Correlations	
	Mean	Median	25th	75th	Pearson	Spearman
One month vs Four month recall						
SLMS March Sales Asked in Round 1 (April)	12358	7100	3000	15000	0.491	0.654
SLMS March Sales Asked in Round 2 (July)	11185	6000	2050	15000		
% difference	-9.5	-15.5	-31.7	0.0		
Quarterly recall vs Annual recall						
SLMS 12 month sales as sum of quarterly	256598.7	142922	66700	334000	0.763	0.841
SLMS 12 month sales as recall over year	248167.3	132000	60000	300000		
% difference	-3.3	-7.6	-10.0	-10.2		

Table 6: How much difference does keeping books make?
Treatment Effect for the Treatment of Receiving an account book

	KMS September		SLMS round 3		SLMS round 4	
	Pure effect	controlling	ITT effect	TOT effect	ITT effect	TOT effect
Outcome:		for lagged outcome				
Total Revenues	4123	5418	1050	2141	4352	7689
	(0.82)	(1.56)	(0.57)	(0.57)	(1.62)	(1.61)
Purchase of materials and items for resale	6209	7412	726	1461	3094	5344
	(1.32)	(2.25**)	(0.46)	(0.46)	(1.64)	(1.63)
Total Expenses	6191	7286	755	1541	2288	4038
	(1.29)	(2.14**)	(0.48)	(0.48)	(1.17)	(1.16)
Revenue - Expenses	-2068	-1988	356	726	2363	4178
	(1.02)	(0.98)	(0.28)	(0.28)	(1.57)	(1.56)
Value of goods used for home consumption	783	708	12	25	-12	-22
	(2.02**)	(1.89*)	(0.09)	(0.09)	(0.09)	(0.09)
Profits	103	379	716	1431	-117	-204
	(0.17)	(0.72)	(1.42)	(1.41)	(0.29)	(0.29)
Sample Size	173	173	418	418	413	413

Notes: For firms not keeping financial records in baseline survey
All SLMS regressions also include the round 2 (pre-treatment) lagged outcome.
Robust t-statistics in parentheses.
*, **, and *** indicate significance at the 10%, 5% and 1% levels respectively.

Table 7: Correlation between Revenue-Expenses and Profits for those with and without book treatment

	KMS September	SLMS round 3	SLMS round 4
Pearson Correlation: Treated with books	0.126	0.168	0.453
	[-0.08, 0.33]	[-0.02, 0.36]	[0.25, 0.66]
Pearson Correlation: Untreated	0.231	0.277	0.458
	[-0.04, 0.50]	[0.02, 0.54]	[0.30, 0.62]
Spearman Correlation: Treated with books	0.075	0.535	0.624
	[-0.11, 0.26]	[0.42, 0.65]	[0.52, 0.73]
Spearman Correlation: Untreated	0.431	0.468	0.492
	[0.20, 0.67]	[0.34, 0.60]	[0.37, 0.61]

Note: 95 percent bootstrapped confidence intervals in parentheses.
For firms not keeping financial records in baseline survey

Table 8: Do firms deliberately misreport?
% of firms saying that many enterprise owners tend to:

	KMS	SLMS
Expenses:		
firms overstate expenses	54	45
firms understate expenses	10	13
firms state expenses correctly	36	42
Revenues:		
firms overstate revenues	1	4
firms understate revenues	86	60
firms state revenues correctly	13	36

Table 9: If the truth is 10,000, how much would owners report?

	Revenue		Expenses	
	KMS	SLMS	KMS	SLMS
Mean	6744	8204	12254	11417
10th percentile	4500	6000	10000	8000
25th percentile	5000	7000	10000	10000
50th percentile	7000	8000	12000	10000
75th percentile	8000	10000	15000	13000
90th percentile	10000	10000	15000	15000

Table 10: Comparison of Reported Sales to Directly Monitored Sales
For 58 KMS firms receiving visits every 2 days

	Mean	S.D.	Median	25th	75th
Hours of transactions observed in month	8.2	1.8	8.0	7.0	9.3
Reported Sales for September	37090	26205	30360	17150	50462
Estimated Sales based on observed transactions and weekly hours reported	53630	39224	44405	22723	71712
Implied % underreporting	30.8		31.6	24.5	29.6

Figure 1: One month vs Four Month recall of Monthly Sales for the Month of March 2005.

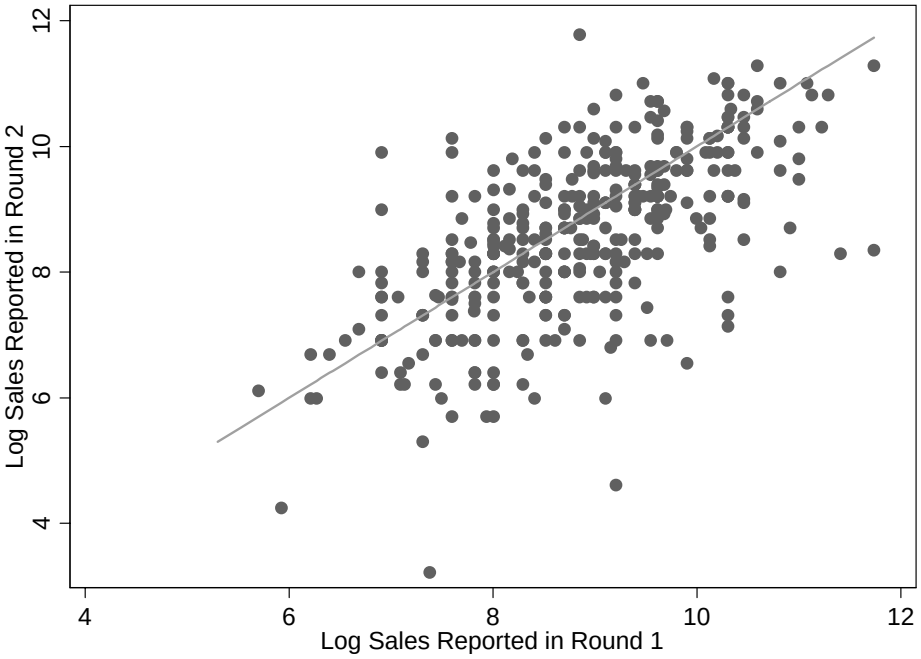


Figure 2: Quarterly vs Annual recall of 12 month sales for the year 1 April 2005 to 31 March 2006

