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Measuring Income from Family Enterprises with Household Surveys

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Measuring Income from Family Enterprises with Household Surveys

The Living Standards Measurement Study

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LSMS Working Paper
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Measuring Income from Family Enterprises with Household Surveys

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ABSTRACT

The accuracy of the measured income of family enterprises is a matter of importance in studies of, inter alia, human capital, income distribution and consumption behavior. One may measure this income as part of a household survey or through an enterprise survey.

Household surveys have advantages over enterprise surveys in studying the income of the self-employed. They capture more of the truly small-scale one-person enterprises, and there is a wealth of information that can be utilized in the study of enterprise income, such as education of other family members, migration history, and possibly employment history. Household surveys also allow one to study the role of family enterprises within the context of the household, in relation to labor supply, risk sharing, enterprise start-up, and asset formation. Thus, household surveys offer a better perspective for study of living standards and poverty.

By comparison, enterprise surveys are able to extract more detailed information about the enterprises than household surveys can. Interviewers of households spend considerable time in gathering information that, for studying enterprises, has no value. Enterprise surveys fully focus on production. Measures of inputs and outputs are the primary objective of the survey, and considerable effort goes into obtaining good measures of these.

This paper examines the three enterprise income values that one may derive from the survey modules of the Living Standards Surveys as held in the Côte d'Ivoire and Ghana, which are household surveys. The three values appear to be fairly imprecise and do not correlate all that well. This conclusion is rather sobering, and it implies that relying on self-reported values of sales revenue, expenditures and enterprise earnings is risky.

The questions of the surveys could be improved. However, the primary change in the methodology of the survey should be an attempt to measure the transactions of enterprises more carefully. Using worksheets and cross-checking responses *in loco* should help, but since many enterprises do not use any accounting system, it may be necessary to monitor inflows and outflows either personally or with diaries.

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MEASURING INCOME FROM FAMILY ENTERPRISES WITH HOUSEHOLD SURVEYS

1. Introduction

What determines the income from small-scale non-farm enterprises is still somewhat of a mystery. The problem is not that the issue has been ignored in the literature. It is true that other income-earning activities have received more attention: there are countless studies of earnings of wage employees and farm productivity. Recently, though, the non-farm self-employed have captured a more important place in the quest to understand the labor market of developing countries. For certain, many people in the labor force of Third World countries are self-employed. It is now also recognized that this segment of the population may be important for macro-economic policy-making.¹ Yet, much remains to be known about these self-employed.

Micro-economic studies of family enterprises have yet to make an undisputable link between determinants like education and family capital on the one hand, and enterprise income and productivity on the other. In two related studies on the Côte d'Ivoire Living Standards Survey (CILSS) of 1985, Vijverberg (1988, 1991) describes attributes of Ivorian family enterprises and does a regression analysis on their income to quantify the contribution of family labor and family capital. Estimates vary substantially between sectors, possibly owing to the small sample size, and variables that were expected to be important (education, experience) appeared to be irrelevant. Moock, Musgrove and Stelcner (1990) used the Peru Living Standards Survey which

¹E.g., Heller et al. (1988), Portes, Castells and Benton (1989).

yielded four times as many observations on family enterprises. They obtained more precise estimates of the contribution of education, with some interesting differences between the various sectors. Still, it proved difficult to put forth a consistent picture of the contribution of family capital.

Other studies of small-scale family enterprises include Wilcock and Chuta (1982), and Strassmann (1987). In these studies, as well as in those by Cortes, Ishaq and Berry (1987), Little, Mazumdar and Page (1987), Steel (1977), and many others surveyed in Page (1979) and Little (1987), the source of data is an enterprise survey. There is an important difference: sampling enterprises differs from sampling households. Since many family enterprises operate from the home, may be loosely organized, and are likely not even officially registered (one of the alleged characteristics of the informal sector, see Hart (1973) and ILO (1972)), an enterprise survey may well be biased toward measuring larger enterprises. In fact, the studies by Page (1979), Ho (1980), Cortes, Ishaq and Berry (1987), and Little, Mazumdar and Page (1987) show a drastically different size distribution of firms than studies by Vijverberg (1988) and Mook, Musgrove and Stelcner (1990). Such difference in size distribution may be due to sampling variation, but randomly sampling from households should yield a random sample of enterprises.

Household surveys have advantages over enterprise surveys in studying the self-employed, but these advantages only come at a relative loss of detail (see Section 2). The purpose of this paper is to assess whether the Living Standards Survey provides accurately enough measures of the relevant enterprise variables that it warrants continued efforts to collect information of the family enterprises. The primary focus will

be the income variables, and it is not the purpose of this paper to determine what contributes to family enterprise income.² Rather, this paper evaluates the survey modules that allow one to calculate enterprise income.

So far, as mentioned above, only the 1985 CILSS and the Peruvian LSS of 1985-86 have been extensively analyzed, with a focus on finding determinants of enterprise income. This paper examines both the 1986 CILSS data and the data of the combined 1988 and 1989 Ghana Living Standards Survey (GLSS). In comparison with the 1985 CILSS and the 1986 Peruvian survey, the enterprise module was rearranged in order to measure enterprise income more accurately (see Section 3).³ Moreover, the 1986 CILSS and the GLSS surveys allow one to calculate three different measures of enterprise income. This paper evaluates each measure.

For yet another reason, it is important to ensure that the enterprise income measure is accurate. In a myriad of analytical and policy questions, income plays the role of an explanatory variable. Measurement error weakens the reliability of the estimated effect of income.

Section 4 compares the three income measures and will pose the question why these are different. Section 5 takes a cursory look at other aspects of the enterprise data, mainly focusing on the correlation of various measures of enterprise size. Section

²Vijverberg (1988, 1991) examines family enterprises in the 1985 CILSS, showing that only by non-standard regression analysis one is able to uncover some of the determinants of enterprise income. Mook, Musgrove and Stelcner (1990), using the Peruvian LSS, express somewhat of a disappointment about the low coefficient of determination of their regressions: "Coefficients of determination, however, are only .10 or a little more in urban areas, and still lower in the countryside" (p. 21). This compares with values of .40 or higher found for wage employees (Stelcner, Arriagada and Mook, 1988, App. A).

³Also, the 1985 CILSS data, analyzed in Vijverberg (1988, 1991), had been subject to an imputation, so that from that perspective alone a new look at the CILSS data is warranted.

6 evaluates the combined evidence and recommends modifications of the Living Standards Survey, based on the experience with the Ivorian and Ghanaian data.

2. Advantages of household and enterprise surveys.

Household surveys have advantages over enterprise surveys in studying the income of the self-employed. Beside the apparent benefit of capturing the truly small-scale one-person enterprises, there is a wealth of information that can be utilized in the study of enterprise income, such as education of other family members, migration history, and possibly employment history. Complementarity relationships can also be researched: does the family enterprise provide flexible-hours jobs to family members who would benefit from such arrangements (e.g., young mothers); does the family enterprise form a risk-sharing role within the household? Another issue of interest relates the asset position of the enterprise to the household and vice versa. Thus, household surveys offer a better perspective for a study of living standards and poverty. At the same time, household surveys allow a study of the enterprise start-up process, especially when the surveys are longitudinal. With a longitudinal household survey one observes the enterprise sprouting, whereas an enterprise survey can only observe the enterprise as an existing plant.

By comparison, enterprise surveys are able to extract more detailed information about the enterprises than household surveys can. Interviewers of households spend considerable time in gathering information that, for studying enterprises, has no value. Enterprise surveys fully focus on production. Measures of inputs and outputs are the

primary objective of the survey, and considerable effort goes into obtaining good measures of these. Sometimes, further information is collected. An example is the survey used by Little, Mazumdar and Page (1987). Aside from the aforementioned variables, questions are asked about the entrepreneur's economic environment, such as start-up problems, financial opportunities in credit, output market information, and type of employees and turnover among them. The only personal information is the entrepreneur's job history. No questions were asked in relation to the household.⁴

Obviously, an enterprise survey draws a random sample from the population of enterprises. A household survey draws from the population of households. Are enterprises observed in a household survey a random sample of the population of enterprises? Suppose that each household has at most only one enterprise. The sampling process of households would yield many households without an enterprise and some with an enterprise. Since the latter group is random, the sample of enterprises observed through a household survey is random as well.⁵ The case where households contain more than one enterprise seems more complicated, but every enterprise still has an equal probability of being observed, as long as a selected household reports on all enterprises: the probability equals the likelihood that the household is selected. The

⁴Another example is Cortes, Berry and Ishaq (1987) who report: "Questionnaires sought information not only about outputs and inputs, but also about entrepreneurship, methods of production, technological characteristics, and growth prospects and constraints faced by the firms in the sample; cross-checks to test the quality of responses to some questions were built into the design." (p. 230) They tabulate variables such as educational attainment and employment background of the entrepreneurs, but they do not provide detailed information about the survey. In a recent survey in Ghana, Steel and Webster (1990) focus on the business environment of small-scale firms in Ghana. The 1-to-2-hour survey does not include quantitative information about inputs or outputs, but does inquire about the entrepreneur's background.

⁵In other words, if one is really interested in enterprises only, a household survey would be inefficient survey instrument, drawing too many irrelevant observations.

sampling process does yield a few differences, however. There is a higher probability of selecting enterprises that are partnerships with the partners residing in different households. Also, public enterprises and corporations are unlikely to be observed, as the ownership does not belong to any household in particular. Thus, if a purely random sample of enterprises is desired, an enterprise survey has an advantage.

The Ivorian LSS data allow an interesting comparison of the sampling outcome with an observed population of enterprises. The government of Côte d'Ivoire⁶ held a census of enterprises in 1984. Only "modern sector" firms were included in the sample. The modern sector was defined as comprising

... those establishments in industry, commerce, and services that realized a minimum value of production, or followed an accounting system called "Le Plan Comptable Ivoirien," or, in the case of the agricultural sector, met certain production levels.⁷

The census contained 3112 firms employing 206692 workers. The 1985 CILSS data shows a national labor force participation rate equal to 51 percent of the population over 6 years of age. Also, about 23.4 percent of the population is 0 to 6 years of age, and the mean household size is 8.4. Therefore, the 206692 workers derive from a population of 529084 people of all ages, living in 62986 households. Actually, the population of Côte d'Ivoire in 1984 equalled 9.84 million (IMF, 1989): the modern sector must be employing only a small portion of the population, as we shall now see from evidence from the 1985 CILSS data.

The size distribution of the 3112 enterprises is found in column 2 of Table 1.

⁶Specifically, an agency called *La Direction des Etudes et de la Recherche de l'Office National de Formation Professionnelle*.

⁷Lavy and Newman (1989, p. 99).

Table 1:
Size Distribution of Enterprises in Côte d'Ivoire, 1984-85

Number of Workers	Number of Enterprises	Percent of Households	Expected in 1985 CILSS	Observed in 1985 CILSS	
				All Workers	Paid Workers
1 - 9	1972	3.131	50.10	707	52
10 - 19	370	.587	9.39	11	1
20 - 29	135	.214	3.42	3	3
30 - 49	178	.282	4.51	0	0
50 - 99	163	.259	4.14	1	1
100 - 199	128	.203	3.25	1	1
200 - 299	45	.071	1.14	0	0
300 - 499	45	.071	1.14	0	0
500 - 999	39	.062	.99	0	0
1000+	37	.059	.94	0	0
Total	3112	4.941	79.06	723	58

Assuming that each household houses only one enterprise head, column 3 gives the size distribution by household: 95.1 percent of the households would not own an enterprise, and this percentage is even higher if some households run more than one enterprise. Column 4 shows the number of enterprises, by size, one would expect to observe in a sample of 1600 households, which is the size of the CILSS sample. Then, column 5 presents the size distribution of the enterprises in the CILSS sample where both paid and unpaid workers are counted, and column 6 shows the same when only paid workers are counted. Clearly, the number of small family enterprises appear undercounted in a census, but there is a fair correspondence between the expected and the observed number of enterprises in the more formal sector (column 6). At the high end of the scale, the CILSS data fail to observe any enterprises, which, as argued above, is not surprising, given the sampling framework.⁸

Whether one uses a household or an enterprise survey depends on the objective

⁸Only 1.2 percent (9 of 723) of the enterprises were not fully owned by members of the household, and half of these were owned for 50 percent.

the survey is to fulfill. While in principle a household survey could be as complete as an enterprise survey -- by expanding the survey module about the enterprise and spending more interview time on the enterprise --, the enterprise module of a household survey is generally substantially shorter. Otherwise, the total length of the survey simply becomes excessive, and response quality suffers. The researcher is therefore faced with a trade-off: can one still obtain high-quality information about the enterprise while reducing the enterprise module of the household survey to accommodate the rest of the survey? This question is the central focus of this paper.

In the following section, we shall illustrate the position of the enterprise module within the LSS survey, and indicate what information about the enterprise is requested. In Section 4, we shall investigate the income figures resulting from two of these LSS surveys.

3. The Living Standards Survey.

Previous descriptions of the LSS surveys are available in Ainsworth and Muñoz (1986, Côte d'Ivoire), Grootaert (1986, Côte d'Ivoire), Grootaert and Arriagada (1986, Peru), and Scott and Amenuvegbe (1989, Ghana and Mauritania). A detailed discussion is also provided in Ainsworth and Van der Gaag (1988). A brief summary of the structure of the survey questionnaire is given below, followed by a more detailed description about the enterprise module.

The households questionnaire is partitioned in 17 modules, covering the following topics:

- * Household composition and basic demographic variables
- * Housing
- * Schooling
- * Health
- * Economic activities
- * Migration
- * Agriculture
- * Non-farm self-employment
- * Food and non-food expenditures, and consumption of home products
- * Fertility history
- * Other income, savings and credit
- * Anthropometrics

The module on economic activities covers time allocation both during the week before the interview and during the past year. Hours of work on wage jobs away from the home as well as work on the farm and in family enterprises are enumerated here. The agriculture and non-farm self-employment modules focus more on production-related variables of such activities, such as inputs and outputs.⁹

The household questionnaire is supplemented, in rural areas, by a community questionnaire measuring local amenities and opportunities, and a price questionnaire that allows one to obtain price indices of both consumption and outputs for each locality.¹⁰

The relevant questions in the enterprise module and in the module on economic activities are reproduced in Exhibit 1 below. For each (up to 3) of the family

⁹To avoid overlap, the agricultural and non-farm enterprise modules do not include the family labor input. This is significant since these two modules are covered during a second visit to the household, approximately two weeks after the first. The primary focus is on the performance of the enterprise during those two weeks, and therefore the time allocation information may be dated and is in fact occasionally inconsistent with enterprise responses.

¹⁰Households are sampled in a two-stage random sampling process. First, communities are randomly selected, and then households within each selected community are sampled. This process economizes on the expenses in collecting information about community and price variables.

Exhibit 1: Survey Modules on the Enterprise and on Economic Activities

Enterprise Module, Part B

During the past 12 months did your business (trade, industry, profession, etc.) make any expenditures for the following?	How much do you usually pay for ... for this business? (including the value of payments in kind)	How often do you pay for ... ?	Do your household or other businesses belonging to the household use this ... ?
"yes/no" for each item:	"amount"	Times/Time Unit "number of times" per "day/week/ month/quarter/ half year/ year"	"yes/no"
Wages or other remuneration Raw materials Articles for resale Rental of equipment, land buildings, vehicles or machinery Maintenance and repairs Transport Fuel and oil Electricity Water Daily taxes Annual taxes or licenses Other expenses			

Enterprise Module, Part C

If the business had been in operation since the interviewer's last visit:

1. Since my last visit, how much money has the business received from the sale of its products, goods or services? "amount"
2. Since my last visit, has this business also received payments in the form of goods or services? "yes/no"
If yes: What was the value of these payments since my last visit "amount"
3. Since my last visit, has any of this business' products or services been consumed or used by your household instead of being sold? "yes/no"
If yes: What was the value of the products consumed or used by your household since my last visit "amount"

If the business had not been in operation since the interviewer's last visit:

4. How much did your business make from the sale of goods and services during the last 4 weeks it was in operation, including the value of payments in kind? "amount"

(Continued)

Exhibit 1, Continued

(Enterprise Module, Part C, Continued)

Whether or not the business had been in operation:

5. Do you use part of the money you get from this business for yourself or for your household? "yes/no"
 If yes: How much money from the business do you normally use for yourself or your household? "amount"
 per "day/week/month/quarter/half year/year"
6. After making purchases for the business and after using some money for yourself or your household, is there usually any money left? "yes/no"
 If yes: How much money do you usually have left for after purchases for the business and after using some of the money for yourself or your household? "amount"
 per "day/week/month/quarter/half year/year"

Economic Activities Module

1. For how many days during the past 7 days did you do this work? "number"
2. During these days, how many hours per day did you do this work? "number"
3. Have you received or will you receive money for this work? "yes/no"
 If yes: How much money? "amount"
 per "hour/day/week/month/quarter/half year/year"

enterprises, the questionnaire deals with (A) general firm characteristics, (B) expenditures on a variety of input categories, (C) revenues, and (D) business assets.¹¹

From this questionnaire, three measures of enterprise income can be calculated:

¹¹In the 1985 CILSS, the first in the field, part C was placed between A and B. Afterwards, it was placed in its present position since respondents apparently underestimated their revenues. In the 1985 survey, 51 percent of the enterprises reported negative profits (Vijverberg, 1986), whereas in the 1986 survey 37 percent reported negative profits. These percentages refer to enterprises that are aggregates of reported units within four broad industries, which will be defined in Section 4. The reason for this aggregation was (a) the imperfect link between the reported industry in the economic activities module and that of the enterprise in the enterprise module; (b) the small sample size within each disaggregated industry; and (c) the sharing of inputs that would more likely occur among enterprises within one industry. Reason (a) has caused a modification in the questionnaire in that the family members working in the enterprise are now explicitly identified in the enterprise module, part A.

Profits, defined as total revenue minus total expenditures. Total revenue is calculated from questions C1, C2 and C3 if the enterprise was in operation at the time of the interview, or from question C4 if it was not in operation. Note that since the number of days between the two rounds of the interview differ slightly, one must adjust the answer accordingly to obtain monthly or annual revenue values. Total expenditures are obtained by summing the items of part B, in principle accounting for input sharing (see discussion in Section 5).

Net Revenue, defined as the sum of values under question C5 and C6, in addition to the home consumption measure C3. This last value is only observed for enterprises currently in operation, which is 79 in the 1985 CILSS sample and 81 percent in the 1986 CILSS sample.

Earnings, defined as the income reported in the economic activities module, question 3, summed over all household members associated with that family enterprise.

In a sense, the last measure in particular is somewhat redundant. The economic activities module deals in much greater detail with conditions of wage jobs, which applies only to a smaller part of the population, and it describes home activities and employment history, which are generally applicable. However, the earnings measure does assist to examine the reliability of the enterprise module. We shall now turn to a discussion of the calculated income measures.

4. Analysis of Measures of Income from Family Enterprises.

This paper examines the data collected by the Côte d'Ivoire LSS in 1986 (CILSS) and the Ghana LSS in 1988 (GLSS88) and 1989 (GLSS89). The CILSS sample contains 1600 households, of which 543 reported on one or more family businesses. The GLSS88 sample contains 3136 households, with 1701 reporting on family enterprises. In principle, the GLSS89 sample is of similar size, but this paper uses only a random

subsample of this, for which test scores on reading, mathematics and abstract thinking were collected. This subsample contains 1633 households, with 956 reporting on family businesses. The two Ghanaian samples are pooled in order to reduce the expositional burden; detailed examination reveals few substantial differences.¹² As Ghana experienced substantial inflation in 1988 and 1989,¹³ income measures are calculated in prices of January 1989. Incomes are measured in the local currency. In 1986, CFA 395 = US\$1 (see IMF, 1988), whereas in January 1989, C230 = US\$1.

Enterprises within each household are aggregated within a detailed industry code (see footnote 11). The (aggregate) enterprises are grouped into broad industries, separately analyzed in an attempt to reduce the heterogeneity between enterprises. The detailed industry categories are given in Appendix A. Within each survey, the two largest industry groups are represented in the tables below; all industry groups are fully reported in Appendix B. All enterprises with missing information on any of the three income variables are omitted, as well as those which reported zero total revenue from sales (on the assumption that such information is in error).¹⁴

As a first impression of the data, Table 2 presents a variety of descriptive statistics of the profit, net revenue and earnings variables as defined in Section 3, as

¹²Pooling the sample is not an entirely innocuous action. Since the survey is an overlapping sample, about half of the GLSS89 households were already interviewed in 1988, and their family enterprises are part of both the GLSS88 and the GLSS89 sample. This may undermine the i.i.d. assumption behind some of the test statistics reported below. On the other hand, this assumption may already be violated to some degree by the stratified nature of the sampling process: correlation between households from the same clusters may be nonzero.

¹³Inflation equalled 30 percent during the first year of the GLSS survey, and 24 percent during the second year.

¹⁴As a percentage of the original samples, these losses amounted to 3.25 percent of the CILSS, 12.09 percent of the GLSS88, and 9.87 percent of the GLSS89.

well as those statistics of these three variables mixed.¹⁵ The industries are listed by their sample size. Recall that, by construction, profits can be negative, whereas net revenue and earnings are always reported positive.

Variable	Mean	St.Dev	Percentiles					IQR
			10%	25%	50%	75%	90%	
A: Food Commerce (N=272, CILSS)								
Profits	-10808	131306	-84550	-21900	1776	18263	52331	40162
Net Rev.	51358	277768	3397	9496	19491	42087	83381	32590
Earnings	103885	328333	8690	21998	44539	89932	200000	67934
Mixed	48145	263504	-14600	4345	19705	47247	99656	42902
B: Non-Food Commerce (N=186, CILSS)								
Profits	13861	2196734	-125120	-16181	6264	54916	141632	71096
Net Rev.	71505	123670	3595	8632	30637	79727	165928	71095
Earnings	252573	1420164	6083	15208	50000	167292	339187	152083
Mixed	112646	1512643	-7457	6083	27512	100000	220230	93917
C: Commerce (N=1471, GLSS)								
Profits	-31991	396095	-71847	-24623	-4337	2623	14209	27246
Net Rev.	11731	21688	1157	2877	6733	13607	25831	10729
Earnings	15978	61297	665	2072	5861	15216	35527	13144
Mixed	-1428	232706	-16920	383	4027	11357	26015	10974
D: Food Manufacturing (N=534, GLSS)								
Profits	-11410	58857	-39510	-11109	-1448	4868	16451	15977
Net Rev.	8995	10094	1455	2868	5651	11738	20308	8870
Earnings	12194	19198	1566	2773	6235	13156	28457	10384
Mixed	3260	37673	-8007	1033	4300	10279	22038	9246

Immediately noticeable is the difference in mean value of the three enterprise income measures. In three of the four industries represented in Table 2, average profits are even negative, and in the two Ghanaian industries more than half of the enterprises show negative profits. Average earnings are twice average net revenue in the CILSS sample, but correspond fairly closely in the GLSS data. In the industries not shown

¹⁵Within an industry, all values of the three variables are pooled in one sample that is then three times as large. The purpose is to see the overall spread of the data.

here, similar patterns are found, although smaller proportions of those Ghanaian enterprises report negative profits. Recall that under ideal measurement conditions the values should be identical.¹⁶

Another feature of Table 2 is the large standard deviation: there appears to be a large amount of variation in income between enterprises. As it is well-known that means and standard deviations are strongly affected by outliers, Table 2 also presents various percentiles. They allow us to draw the following conclusion: (1) the distribution of the profits variable is generally lowest, followed by the distribution of net revenue; earnings are generally higher, particular in the CILSS sample; (2) the distribution of each measure, but especially profits and earnings, have long tails with some far-out values.

In Table 2, we have received a characterization of the distribution of income measures across enterprises. While this is useful -- it has pointed out the presence of large positive (and negative) values --, we are more interested in the quality of each variable in measuring enterprise income. Two extreme situations may occur when we rank them by their three values of income: all enterprises are in the exact same order, or they appear in random (or even reversed) order. We must therefore examine values of the three income measures with each other directly.

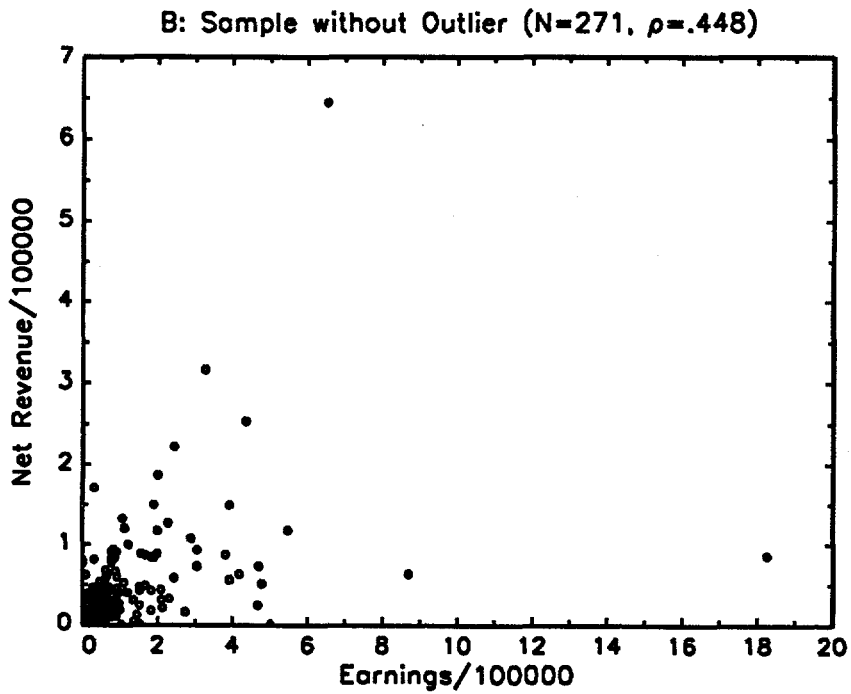
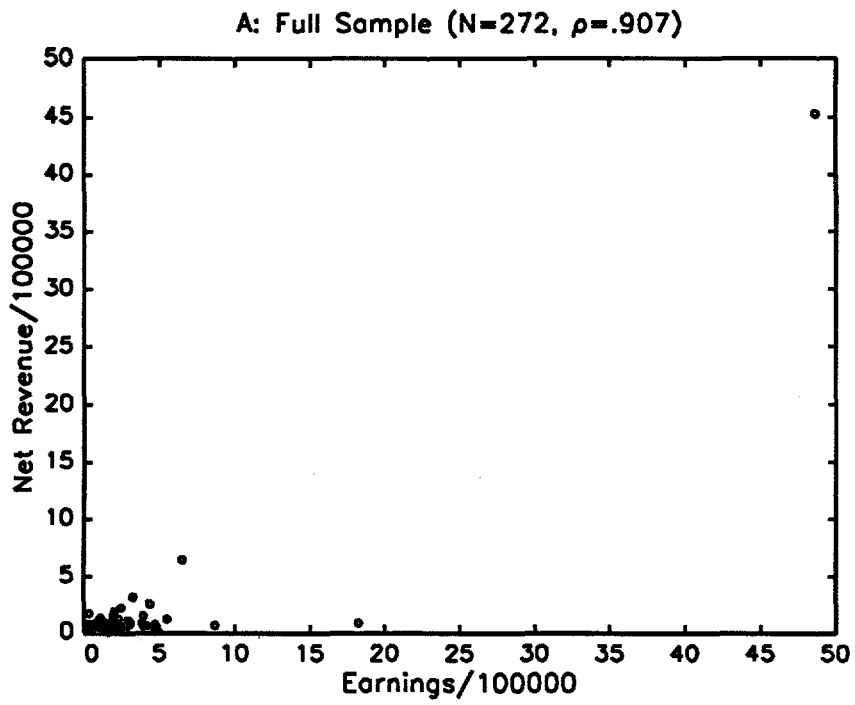
As a first step, we calculate correlation coefficients (Table 3). Two types of correlation measures are presented. Part A refers to the common Pearson correlation

¹⁶Losses ought to be reported in the economic activities module and under question C6 of the enterprise module as negative values. In practice, the survey was fielded under the assumption that enterprises would never drain the household's cash flow: interviewers were instructed not to accept a negative value for question C6, or for question 3 of the economic activities module.

Table 3: Correlations between the Enterprise Income Measures					
<u>Measured Correlation</u>	<u>CILSS</u>		<u>GLSS</u>		
	<u>Food Commerce</u>	<u>Non-Food Commerce</u>	<u>Commerce</u>	<u>Food Manufacturing</u>	
<u>A: Pearson Correlation</u>					
Profit and Net Rev.	.387	.143	-.294	.058	
Profit and Earnings	.431	.268	-.008	-.016	
Net Rev. and Earnings	.907	.177	.197	.349	
<u>B: Rank Correlation:</u>					
<u>Kruskal-Wallis Chi-Square Approximation Test Statistic^a</u>					
<u>Variable</u>	<u>Ranking by</u>				
Net Rev.	Profit	81.9 U	58.5 U	394.9 U	116.3 U
Earning	Profit	95.3 U	73.0 U	183.5 U	68.8 U
Profit	Net Rev.	13.8	14.5	41.5 \	18.9 U
Earning	Net Rev.	110.0 /	77.5 /	267.1 /	87.7 /
Profit	Earnings	12.1	20.5 /	27.7 \	4.7
Net Rev.	Earnings	101.8 /	80.2 /	288.9 /	96.7 /
<p>Note: ^{a/} Critical values of the Chi-Square statistic are 14.68 (10 percent significance level), 16.92 (5 percent) and 21.67 (1 percent). The apparent pattern of the average rank score over the ten groups according to the variable by which the sample is ranked is also indicated: down (\), U-shaped (U), or up (/). Insignificant rank correlations are of course associated with no apparent pattern.</p>					

coefficients. The highest correlation generally exists between net revenue and earnings. The correlation coefficient of .907 in the first column of course catches the eye. However, as is wellknown, correlation coefficients are also strongly affected by outliers. The value of .907 is a classic example. One enterprise reports a net revenue that is 7 times as large as the next highest and an earnings value that is 2.67 times as large as the next largest value. Figure 1, part A, shows the scatterdiagram of net revenue against earning for the Ivorian food commerce sector. Part B omits this one enterprise: suddenly the positive pattern is much less clear. The first column of Table 3 would read: -.022, .182, and .448. Clearly, a further examination of individual enterprise values is necessary.

Figure 1: Scatterdiagram, Ivorian Food Commerce



For that reason, part B of Table 3 presents rank correlation statistics. To calculate a rank correlation, the sample of each industry is ranked by the two variables to be correlated. Then the sample is divided into ten groups on the basis of one variable (X) and the within-group average rank scores of the other variable (Y) are calculated. A chi-square test score measures whether the group averages differ from the median score; if they differ, group-average ranks of Y may rise, fall or show other patterns relative to the ranking of X.

Thus, the first two lines show a significant rank correlation statistic when the sample is divided by the profits value. In this case, the values of net revenue and earnings appear to first decrease and then increase with the profit grouping. Lines 3 and 5 point out that, with the sample divided into groups on basis of net revenue and earnings, profit values are randomly distributed across the groups. If profits were measured better, we would have seen significant chi-square statistics with positive patterns everywhere on lines 1, 2, 3 and 5 of Table 2, part B. An illustration of the patterns found through rank correlation is found in Figure 2, depicting the Ivorian food commerce sector. A line labeled Y_x indicates the pattern of group-average ranks of Y when groups are determined by X.

A further method of comparing enterprise income measures directly is to rank them among each other within each enterprise. This will show more directly whether one particular method of measurement leads consistently to different answers than another. Table 4 shows this within-enterprise ranking of the income measures. Since profits can be negative and then are always the lowest of the three variables, this category is separated in the table. Apparently, net revenue does indeed take the

median position among the three enterprise measures (as the global descriptive statistics of Table 2 suggested), but it does not do so consistently. In every industry, around 50 percent of the enterprises report a net revenue value that falls outside the profit and earnings measures. It also appears that profits are fairly systematically lower and earnings higher. The manufacturing sector deviates the most from this "rule."

Variations in rankings are not disturbing when the magnitudes are relatively close together. Table 5 compares the magnitudes. The bounds chosen to generate the

Relative Magnitude	CILSS		GLSS	
	Food Commerce	Non-Food Commerce	Commerce	Food Manufacturing
<u>P=Profits, N=Net Revenue:</u>				
P < 0 < N	46.0	38.2	62.7	56.0
P > 0, and: N > 3P	10.7	7.5	7.2	8.1
1.5P < N < 3P	12.1	11.8	6.3	7.5
N < 1.5P, P < 1.5N	18.8	21.5	10.9	14.4
1.5N < P < 3N	7.7	11.8	5.0	8.1
P > 3N	3.7	7.0	6.6	5.8
P = 0 or N = 0	1.1	2.2	1.3	.2
<u>P=Profits, E=Earnings:</u>				
P < 0 < E	46.3	38.7	60.8	55.2
P > 0, and: E > 3P	23.9	17.8	9.6	11.4
1.5P < E < 3P	17.3	14.5	5.2	6.9
E < 1.5P, P < 1.5E	9.2	17.2	7.1	11.8
1.5E < P < 3E	1.8	4.3	4.5	6.4
P > 3E	.7	7.5	7.6	7.2
P = 0 or N = 0	.7	.0	5.3	1.1
<u>N=Net Revenue, E=Earnings:</u>				
N > 3E	3.3	7.5	16.5	12.6
1.5E < N < 3E	6.3	7.5	18.1	15.9
N < 1.5E, E < 1.5N	23.9	33.9	24.1	31.5
1.5N < E < 3N	30.2	22.6	16.6	17.8
E > 3N	34.6	26.3	18.4	21.0
N = 0 or E = 0	1.8	2.1	6.4	1.4

tabulation are the 50 and 200 percent marks. Thus, for example, if profits (P) is close to net revenue (N), we will find many observations in the group with $N < 1.5P$ and $P < 1.5N$ (or equivalently, $.667P < N < 1.5P$). Extreme deviations fall beyond the 200 percent boundary where either $P > 3N$ or $N > 3P$.

In reality, however, profits are reportedly negative for a good number of enterprises, especially in commerce, and only in a few sectors do more than half of the enterprises report profits and net revenue within 200 percent of each other (i.e., $.33P < N < 3P$). The comparison between profits and earnings are even poorer, as one might have expected on basis of results presented earlier in this paper. The comparison between earnings and net revenue is more satisfactory, but only if one is satisfied with the 200 percent bounds.

It becomes clear that the income measures may be fairly imprecise. If one is forced to choose a single measure to represent enterprise income, one would probably choose net revenue.

This still begs the question what causes the difference between the income measures. The first hypothesis is that respondents were unclear about the questions they were asked. In relation to earnings, they were asked "Have you received or will you receive money for this work?" and if so, "How much money?" and "How often?" (see Exhibit 1). It is not explicitly stated that the object of the question is net returns from self-employment, i.e., what we call earnings in this paper. Could it be that respondents answered with gross (total) revenue? Table 6 compares these two variables: one should be uncomfortable with the large percentage of respondents who report two numbers within 20 percent of each other. There appears to be a systematic difference between

Earning/Total Revenue Ratio	CILSS		GLSS	
	Food Commerce	Non-Food Commerce	Commerce	Food Manufacturing
0.0 - 0.4	10.3	16.1	44.8	37.6
0.4 - 0.8	17.3	16.1	17.5	21.2
0.8 - 1.2	34.2	36.5	12.6	12.6
1.2 - 2.0	17.6	18.3	8.7	15.4
2.0 - 5.0	14.3	7.5	10.7	10.1
> 5.0	6.3	5.4	5.7	3.2

the Ivorian and the Ghanaian samples: the GLSS results shows lower earnings/total revenue ratios. Still, it is hard to understand why 30 percent of the sample would report earnings that are more than 20 percent higher than the value of sales. It is possible that for some enterprises earnings are actually a measure of total revenue rather than net returns, or, alternatively, that for some enterprises "total revenue" measures the net returns.¹⁷

Therefore, a second hypothesis, one that may shed light on the alternative explanations for the patterns shown in Table 6, is that some of the respondents did not reveal their total revenue accurately. Some evidence of this is presented in Table 7, where net revenue is compared to total revenue. Recall from Section 3 that the interviewer first asks about total revenue and then about the amount of money that is left over for use in the household. Of course, total revenue should be larger than net

¹⁷This was the central concern in Vijverberg (1986), where an econometric switching regression model was estimated on the 1985 CILSS data, in order to distinguish (i) firms which reported earnings as net returns from those which reported earnings as total revenue; and (ii) firms which reported total revenue as intended from those which reported total revenue as net returns. The result was, however, that apparently almost all enterprises reported earnings as net returns. On the other hand, over three-fourths of the enterprises appeared to respond with their net returns when gross revenue was asked for.

Table 7:
Comparing Net Revenue to Total Revenue of the Enterprise

Net Revenue/Total Revenue Ratio	CILSS		GLSS	
	Food Commerce	Non-Food Commerce	Commerce	Food Manufacturing
0.0 - 0.4	32.4	37.1	42.2	42.7
0.4 - 0.8	35.6	25.8	24.1	24.9
0.8 - 1.2	23.5	24.7	12.4	14.0
1.2 - 2.0	5.1	5.9	10.3	11.8
2.0 - 5.0	2.6	2.7	9.0	5.6
> 5.0	.7	3.8	2.0	.9

revenue. Table 7 shows that this is more consistently the case than in the comparison with earnings, but that still around 40 percent of the sample reports net revenue that are close to or exceed total revenue. Detailed inspection of individual responses showed cases where the sales revenue "since the last visit" was less than the amount "normally used for yourself or your household" or the amount that is "usually left over after purchases for the business."

A third hypothesis is that measurement of total expenditures is faulty. Table 8 shows the percentage of enterprises that reported no expenditures during the last 12 months, and the percentage where the maximum single expenditure item exceeded total revenue. Non-reporting of expenditures, which would lead to an overestimate of profits, are observed more often in manufacturing and services. On the other hand, cases where expenditures on a single input exceed total revenue occur mainly in commerce and in food manufacturing, and then often refer to items for resale and raw materials.

In still another way, measurement error may have entered in the calculation of total expenditures. The survey asks whether expenditures on a certain category were shared with the household or another family enterprise belonging to the household, but

	CILSS		GLSS	
	Food Commerce	Non-Food Commerce	Commerce	Food Manufacturing
No Expenditures Reported (%)	.0	2.2	1.8	1.5
One Input Item Exceeding Reported Total Revenue (%)	40.8	31.7	58.2	48.1
Value of Inputs Reportedly Shared ^a	81738	180970	48143	19769
(% of Total Expenditures)	(63.2)	(46.6)	(66.6)	(54.2)
Value of Inputs Identified As Being Shared ^a	1408	750	64	44

Note: ^aMean value per enterprise

the proportion shared is not asked (see Exhibit 1). The only way to utilize this information is to compare the information given for a particular enterprise with that of other enterprises in the same household.¹⁸ This survey question is hardly effective. Table 8 shows the average amount reportedly shared, which is generally between 30 and 65 percent of total expenditures, and the average amount that was identified as being shared and by which total expenditures were revised downward. The latter amount is trivial. To the extent that expenditures are thus overstated, the profits value will be too low.

A fourth hypothesis is that respondents truly have little idea about their sales. The schooling rates among Ivorian enterprise heads presented in Table 9 corresponds with the occurring pattern of negative profits between industries: within each industry,

¹⁸Specifically, if two (or even three) enterprises report sharing a particular expenditure and if the reported value and time unit agree, the item is assumed shared between the enterprises, and the share within each enterprise is assumed equal to the relative value of total expenditures. Thus, if one enterprise reports sharing an input but the other enterprise benefitting from the sharing does not report on the input, no sharing has taken place according to this rule. Note also that one cannot determine how much is shared with the household. This rule of identifying the quantity of inputs sharing is strict, but any other rule seems arbitrary.

	Percent of enterprises with an educated head	<u>Percent of enterprises with negative profits and</u>	
		with educated head	with uneducated head
<u>CILSS</u>			
Food Commerce	16.9	41.3	47.4
Non-Food Commerce	24.7	30.4	41.4
Manufacturing	35.1	18.0	19.4
Services	38.2	23.8	8.8
<u>GLSS</u>			
Commerce	46.7	61.9	63.4
Food Manufacturing	32.8	61.7	53.2
Services	60.2	40.6	25.7
Other Manufacturing	43.0	27.2	23.8
Textiles Manufacturing	70.2	32.2	24.3
Agriculture & Mining	20.8	50.0	9.2
Note: A person is labeled "educated" if (s)he has completed 3 years of schooling in Côte d'Ivoire or 6 years of schooling in Ghana.			

enterprises with a head who had 3 years or more of schooling are a little less likely to have negative profits. On the other hand, the correlation of education and the incidence of negative profits in Ghanaian enterprises is negative except commerce. A comparison between the income measures as in Table 5 turned up few other trends, for CILSS or GLSS.

A fifth hypothesis puts the blame of reported outliers on those cases where the enterprise head (i.e., the "best informed person") was not actually interviewed. This was the case for only 5.1 percent of the Ivorian enterprise responses and 3.1 of the Ghanaian ones. A comparison as in Table 5 showed no trend that enterprise heads gave more consistent responses.¹⁹

¹⁹Only in the Ivorian food commerce sector, where someone else than the best informed person was interviewed in 8.1 percent of the enterprises, was the profit/earnings ratio noticeably lower.

5. Measures of Enterprise Size

Evidence about the quality of enterprise income variables may also be found in their correlation with either enterprise size or income determinants. The most frequently used technique for such analysis is regression analysis, exemplified by the studies of Moock, Musgrove and Stelcner (1990) and Vijverberg (1991). As the Ordinary Least Squares regression technique is quite sensitive to outliers, we use less sensitive techniques, such as rank correlation. A more detailed analysis is left for the future.

In the following, enterprises are ranked according to capital stock and hours of family labor.²⁰ The Kruskal-Wallis chi-square test statistics, which are reported in Table 10, indicate whether rankings are significantly correlated.²¹

The profits variable is not significantly correlated with enterprise size, with few exceptions. In the Ghanaian commerce sector, we find a significant positive correlation, but the pattern is actually negative: enterprises that use comparatively more family labor report lower profits. In contrast, net revenue and earnings are almost always significantly correlated with both the capital stock and the hours of family labor. Test statistics are also reported for the ranking measure among themselves, to examine whether they are consistent. Test statistics are usually significant, but the pattern is

²⁰An alternative measure of enterprise size is the number of paid employees, but many enterprises do not hire workers for pay. Thus, the number of paid workers may only distinguish the "very large" family enterprises from all others.

²¹As before in Section 4, the observations are first ranked into 10 groups according to the value of the exogenous variable (e.g., capital stock). Based on this grouping, the test statistic is calculated from the within-group average rank scores of the endogenous variable (e.g., profits). Actually, the grouping is not necessary for the test statistic to be calculated, although a finer grouping could conceivably lead to more frequent rejection of the Null Hypothesis of no rank correlation.

Table 10:
Rank Correlations between Enterprise Income Variables and
Measures of Enterprise Size

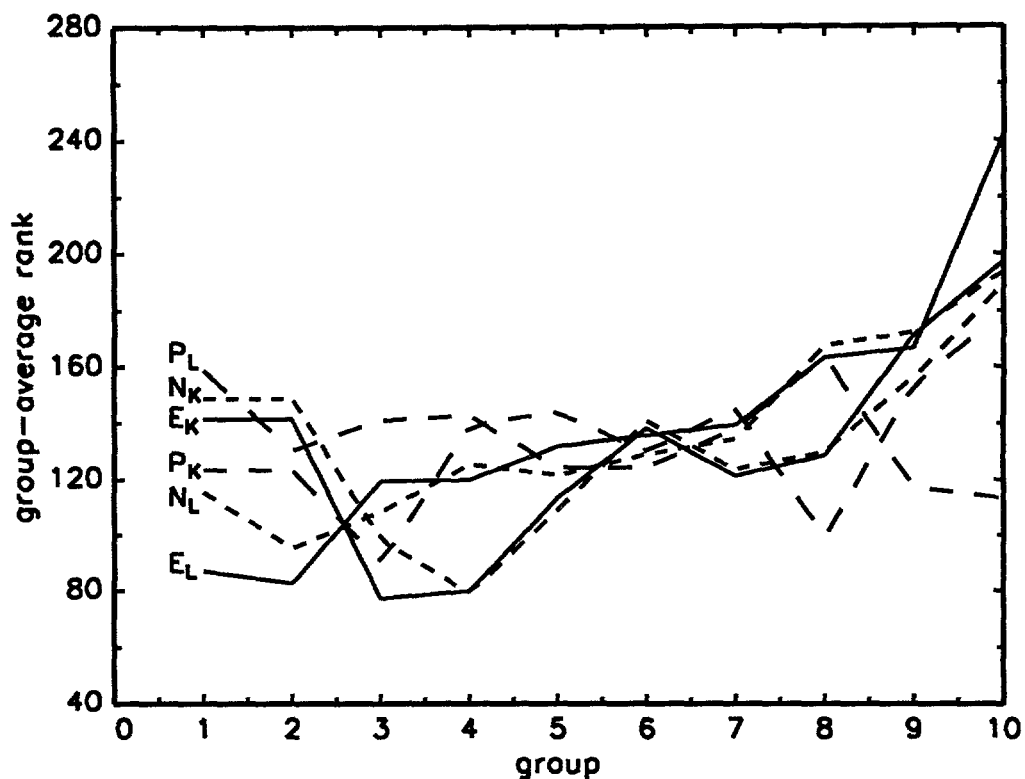
Ranked by	Profit	Net Rev.	Earnings	Capital	Family Hours
<u>A: Food Commerce (CILSS)</u>					
Capital Stock	19.1 ^b	35.0 ^a	40.4 ^a	.	21.9 ^a
Family Hours	11.4	38.2 ^a	58.7 ^a	19.0 ^b	.
<u>B: Non-Food Commerce (CILSS)</u>					
Capital Stock	6.0	52.6 ^a	57.0 ^a	.	46.2 ^a
Family Hours	10.0	37.6 ^a	53.1 ^a	30.7 ^a	.
<u>C: Commerce (GLSS)</u>					
Capital Stock	4.8	153.1 ^a	76.2 ^a	.	117.1 ^a
Family Hours	23.5 ^a	170.0 ^a	139.8 ^a	95.8 ^a	.
<u>D: Food Manufacturing (GLSS)</u>					
Capital Stock	13.2	72.7 ^a	50.3 ^a	.	28.1 ^a
Family Hours	11.4	71.1 ^a	61.7 ^a	39.3 ^a	.
Notes: ^a Significant at 1 percent					
^b Significant at 5 percent					

occasionally U-shaped.

To illustrate the difference between the rankings of profits, net revenue and earnings, Figure 3 shows the average rank (median=136.5) within each of the ten groups for the food commerce industry, with enterprises ranked by capital stock (subscript K) and family hours of work (subscript L).²² The line for profits lacks the upward trend, whereas the lines for net revenue and earnings generally rise. This figure also allows another conclusion: the trend is clearer when family hours is used to rank observations. In large part, this owes to the fact that in the first capital-ranked group the average rank of enterprise income is substantially larger. Combined with the

²²The lowest group when ranked by enterprise capital comprises almost 30 percent of the enterprises. Thus, there are only nine distinct groups when ranked by K (whereas there are ten when ranked by L). Figure 3 depicts the lowest group spread out over two decile groups, with the same average rank score.

Figure 3: Rank Correlation between Size and Income, Ivorian Food Commerce



finding that the correlation between capital and family labor is sometimes U-shaped, this suggests fairly strongly that some enterprises that use capital did not report it.

6. Conclusions and Recommendations

6.1. Conclusions

Accurate measures of income from family enterprises are desirable from a number of perspectives. Studies of consumer demand, income distribution, and labor and capital productivity would benefit. This paper analyzed the quality of enterprise income measures obtained through a household survey. The benefit of a such survey

is that one can study the small scale enterprises within the context of household decision making. The disadvantage relative to a focused enterprise survey is the brevity of the enterprise module within the overall survey. There is a trade-off between breadth and depth, between scope of the survey and the precision of the measured variables. When administering a household survey, one aims to minimize the sacrifice of precision by asking the "right" questions. This paper examines the Côte d'Ivoire and Ghana Living Standards Surveys which allow us a unique opportunity to evaluate three different enterprise income measures. There is no yardstick by which to evaluate those measures separately, but a comparison among them and with measures of enterprise size forms the foundation of the evaluation.

What do we learn from these comparisons? The following conclusions appear warranted. First, profits are calculated as the difference between total revenue and total expenditures. There is evidence that revenue is understated by some respondents and that expenditures are overstated, both leading to a profits value that is too low. The resulting profits measure shows little correlation with the quantity of both family labor and capital stock, although it should contain the returns to both.

Second, earnings are calculated directly from a self-reported value, where it is only implicitly clear that the question probes for net returns to labor, rather than gross revenue from sales. There is evidence that a few respondents report gross revenue rather than their earnings.

Third, net revenue is also calculated from a self-reported value. Of the three enterprise income measures, it appears to be the cleanest, although there is hardly a rigid standard in these data to compare this measure with. It is disturbing, given the

structure of the questionnaire, to see some respondents report more net revenue than total sales revenue: which measure would be right?

Overall, it is clear that the income measures may be fairly imprecise. If one is forced to choose a single measure to represent enterprise income, one would probably choose net revenue. An alternative strategy would be to take the median value of the three measures, regardless of which variable that would turn out to be. There is a statistical justification for doing so. The three variables attempts to measure the same concept but do so with error. Under the assumption of a mean error equal to 0, the mean of the three variables would be a better measure of the concept than any of the variables by itself, because its average deviation would be smaller. However, as the mean is sensitive to outliers, of which the present sample has many, the median is a superior measure of enterprise income.

If the focus of the study is on the determinants of enterprise income, one might use the earnings variable with the individual as the unit of observation. Earnings are comparable to, and almost as good as, the net revenue measure. One may then regress earnings on the person's characteristics as well as firm capital and other enterprise data. Yet in the case that the family enterprise employs more than one family member, there are some tedious estimation problems associated with such approach.²³

6.2. Recommendations

The survey module on family enterprises (Exhibit 1) contains a section on

²³For example, the estimated contribution of the person's education to enterprise earnings would also include the contribution of others' education, to the extent that educational attainment is correlated across family members.

expenditures, on assets and on revenues. The expenditure section contains no information on prices or quantities and is therefore only useful to derive enterprise income (perhaps with the exception of reported taxes and utilities, which might be policy variables). The question about input sharing is uninformative at present and might be either dropped entirely or expanded with questions about what proportion is shared and whether the household or another enterprise (and which one) benefitted from the shared input. If the expenditure section is maintained, the expansion of the sharing question seems warranted, given the reported extent of sharing.

The assets section appears somewhat flawed in that some respondents are not revealing the value of their capital. Furthermore, this paper has not addressed the issue of spread in capital assets directly, but one might question a few of the extremely large enterprises.²⁴ Information on capital assets is essential for a household survey, and more effort in cajoling the right information out of the respondents is warranted. This could be in the form of a worksheet provided to the interviewer, with a good number of assets categories pre-printed but also some room for additions. The information should then be gathered in quantity and price per unit, so that outliers can be traced to their source.

The revenue section has apparently been improved since the first attempts in Côte d'Ivoire in 1985. Further improvement can be made. The reference period "since my last visit" is too vague. In fact, for 85 CILSS enterprises or roughly 15 percent of

²⁴For example, one CILSS food commerce enterprise reports 60 percent of the total capital stock in the entire food commerce enterprise. The largest reported stock value in the CILSS service sector is 83.3 percent of the total stock in the service industry. Extreme values in the GLSS data are not as dramatic.

all those currently operating, the number of days between the two visits was less than the number of days that the business allegedly operated between those visits.²⁵ The set of questions presented in Exhibit 2 would therefore be preferable. Questions 3 and 11 clarify the reference period. Questions 5 through 10 and 12 are adaptations, with minor rephrasing added. One important change is to focus the respondent on the relevant time period for his answer. Question 4 allows us information on whether the reference period is typical of the operation experience of the firm. Questions 13 and 14 were apparently omitted from previous questionnaire out of oversight. Question 15 is added to make the survey symmetric between the enterprises currently in operation and those not. Without question 15, question 10 is not particularly useful for analysis.

To improve accuracy, the interviewer may need to use a worksheet here also, to record prices and quantities. This is practical for some types of enterprises, i.e., those which sell standardized products. For such enterprises, focused questions on prices and quantities would be beneficial, and the survey might be modified accordingly. The greatest gain in accuracy is obtained, however, when the total revenue and expenditure amounts can be quickly added up to derive a profits figure that ought to be comparable to the net revenue responses in questions 16 to 20. Whether this is done in the field or when the responses are keyed into the computer is not as important, as long as the interviewer can confirm discrepancies with the respondent on a short notice. Alternatively, since many enterprises do not use any accounting system, one may want to monitor inflows and outflows either personally or with diaries. Given the degree of

²⁵For 44 of these 85, the difference was only one day. For 28, the number of days the business supposedly operated between the visits exceeded the number of days between the interviews by 5 or more days.

variation in the three enterprise income measures, it is imperative to find some mechanism to improve accuracy.

**Exhibit 2:
Proposed Questions for Section 10C of the LSS survey
(Modified phrases are italicized)**

1. How many months during the past 12 months was the business in operation? [If 12, go to 3]
2. Has the business been operating since my last visit? [If No, go to 11]
3. *How many days did the business operate during the past two weeks?*
4. *How many days does the business usually operate per week?*
5. *On days that it was in operation during the past two weeks, how much money has the business received from the sale of its products, goods or services? [amount] per [time unit]*
6. *On days that it was in operation during the past two weeks, has this business also received payments in the form of goods or services? [If No, go to 8]*
7. *What was the value of these payments on those days that it was in operation during the past two weeks? [amount] per [time unit]*
8. *On days that it was in operation during the past two weeks, has your household used or consumed any of this business' products or services without payment? . [If No, go to 10]*
9. *What was the value of these products or services on those days that it was in operation during the past two weeks? [amount] per [time unit]*
10. *During the past two weeks, has your business made more sales or fewer sales than usual? [More, Same, Less].....(Go to 16)*
11. *During the last 4 weeks that the business was operating, how many days was it in operation?*
12. *On days that it was in operation, how much money has the business received from the sale of its products, goods or services, including the value of payments in kind? [amount] per [time unit]*
13. *During those last four weeks, did your household use or consume any of this business' products or services without payment? [If No, go to 15]*

(Continued)

(Exhibit 2, Continued)

14. *What was the value of these products or services on those days that it was in operation?*
..... [amount] per [time unit]
15. *During those last four weeks, how were sales in comparison to the weeks before that? . . .*
..... [More, Same, Less]
16. *Do you use part of the money you get from this business for yourself or for your household?*
..... [If No, go to 18]
17. *During days that the business is in operation, how much money from the business do you normally use for yourself or your household?* [amount] per [time unit]
18. *After making purchases for the business and after using some money for yourself or your household, is there usually any money left?* [If No, go to 20]
19. *During days that the business is in operation, how much money do you usually have left after purchases for the business and after using some money for yourself or your household?*
..... [amount] per [time unit]

**Appendix A:
Aggregation of Industry Codes into Broad Industry Categories**

The CILSS survey uses a 30-category division of industries. For practical purposes (related to sample size and identifiability of family workers), these are aggregated into five broad groups as follows. Sample sizes are in parentheses.

- | | |
|----------------------------------|---|
| (1) Agriculture
(N=5) | = Agriculture
Forestry
Fishing/Hunting |
| (2) Manufacturing
(N=111) | = Mining
Food
Textiles and Clothing
Leather and Shoes
Wood
Chemical
Rubber
Metal
Electrical Products
Utilities
Building and Construction
Other Industry |
| (3) Services
(N=55) | = Transmission and Communication
Hotel and Restaurant
Technical Services
Financial Services
Education
Medical Services
Recreation
Personal Services
Public Administration
Other Services |
| (4) Food Commerce
(N=272) | = Food Commerce |
| (5) Non-Food Commerce
(N=186) | = General Commerce
Export
Other Commerce |

The agriculture-related industry has not been analyzed in detail, since it contains too few observations.

The GLSS survey distinguishes 71 detailed industries, grouped into seven broad groups, of which the fishing industry contains too few observations to warrant separate analysis. The number of observations in GLSS88 and GLSS98 are separately indicated.

- | | | |
|-----|--|---|
| (1) | Fishing
(N=68+8=76) | = Fishing |
| (2) | Agriculture/Mining
(N=50+46=96) | = Agricultural and Animal Products (Non-Farm)
Agricultural Services
Hunting
Forestry
Logging
Coal Mining
Petrol and Gas Products
Metal Mining
Other Mining |
| (3) | Food Manufacturing
(N=333+201=534) | = Food Manufacturing
Beverage Industry
Tobacco Manufacturing |
| (4) | Textile Manufacturing
(N=86+38=124) | = Textile Manufacturing
Clothing Manufacturing |
| (5) | Other Manufacturing
(N=154+111=265) | = Leather Manufacturing
Footwear - No Rubber
Wood Manufacturing
Wood Furniture
Paper Products
Printing
Basic Chemicals
Other Chemicals
Petrol Refinery
Petrol and Coal Derivatives
Rubber Products
Other Plastics
Pottery Manufacturing
Glass Manufacturing
Non-Metal Mineral Manufacturing |

Iron/Steel Industry
 Non-Ferrous Metal Industry
 Non-Machine Metal Products
 Non-Electical Machine Manufacturing
 Electrical Machine Manufacturing
 Transportation Equipment Manufacturing
 Photographic and Scientific Equipment
 Other Manufacturing
 Electricity / Gas / Steam
 Water Works / Supply
 Construction

(6) Commerce
(N=928+544=1472)

= Wholesale Trade
Retail Trade

(7) Services
(N=173+101=274)

= Restaurants
 Hotels
 Land Transport
 Water Transport
 Air Transport
 Transportation Services
 Communication
 Financial Services
 Insurance
 Real Estate
 Business Services
 Machine Rental
 Public Administration / Defense
 Sanitary Services
 Education
 Research
 Medical/Dental/Vetinary Services
 Welfare Institutes
 Union and Professional Associations
 Other Social and Community Services
 Entertainment
 Library and Other Cultural Organization
 Other Recreation
 Other Repair
 Laundry and Dry Cleaning
 Domestic Services
 Domestic Services
 Miscellaneous Personal Services
 International Organizations

Appendix B: Detailed Tables for both CILSS and GLSS samples

Table B.1: Complementing Table 2.

Table B.1a: Descriptive Statistics of Enterprise Income Measures (CILSS)								
Variable	Mean	St.Dev	Percentiles					IQR
			10%	25%	50%	75%	90%	
A: Food Commerce (N=272)								
Profits	-10808	131306	-84550	-21900	1776	18263	52331	40162
Net Rev.	51358	277768	3397	9496	19491	42087	83381	32590
Earnings	103885	328333	8690	21998	44539	89932	200000	67934
Mixed	48145	263504	-14600	4345	19705	47247	99656	42902
B: Non-Food Commerce (N=186)								
Profits	13861	2196734	-125120	-16181	6264	54916	141632	71096
Net Rev.	71505	123670	3595	8632	30637	79727	165928	71095
Earnings	252573	1420164	6083	15208	50000	167292	339187	152083
Mixed	112646	1512643	-7457	6083	27512	100000	220230	93917
C: Manufacturing (N=111)								
Profits	83686	656413	-14279	2468	17330	42298	70020	39830
Net Rev.	48960	130604	3178	7712	19712	41103	72506	33391
Earnings	40914	54153	3067	10000	25000	60000	88000	50000
Mixed	57854	386949	1282	7431	19712	44771	78392	37339
D: Services (N=55)								
Profits	116219	586548	-29719	5866	19000	47798	212695	41932
Net Rev.	75091	120369	6721	12800	25863	78840	218620	66040
Earnings	263637	718381	5600	15643	50000	119494	669167	103851
Mixed	151649	542743	4117	11512	26071	79420	323630	67908

Table B.1b:
Descriptive Statistics of Enterprise Income Measures (GLSS)

Variable	Mean	St.Dev	Percentiles					IQR
			10%	25%	50%	75%	90%	
A: Commerce (N=1471)								
Profits	-31991	396095	-71847	-24623	-4337	2623	14209	27246
Net Rev.	11731	21688	1157	2877	6733	13607	25831	10729
Earnings	15978	61297	665	2072	5861	15216	35527	13144
Mixed	-1428	232706	-16920	383	4027	11357	26015	10974
B: Food Manufacturing (N=534)								
Profits	-11410	58857	-39510	-11109	-1448	4868	16451	15977
Net Rev.	8995	10094	1455	2868	5651	11738	20308	8870
Earnings	12194	19198	1566	2773	6235	13156	28457	10384
Mixed	3260	37673	-8007	1033	4300	10279	22038	9246
C: Services (N=274)								
Profits	-14029	177896	-29604	-7551	1403	8257	21182	15808
Net Rev.	14822	23591	952	2430	7054	17688	31070	15257
Earnings	23826	68188	1083	2741	6766	20637	51319	17896
Mixed	8026	111862	-2041	1356	5096	15910	33440	14552
D: Other Manufacturing (N=265)								
Profits	601	63904	-10594	-52	1741	5519	20412	5572
Net Rev.	8686	15009	626	1542	3309	10446	22897	8904
Earnings	10184	18499	548	1353	3650	11181	26831	9827
Mixed	6490	39551	0	929	2920	9129	23144	8200
E: Textiles Manufacturing (N=124)								
Profits	-726	27134	-4368	-502	1291	3648	7959	4150
Net Rev.	5842	7655	691	2024	3592	7052	13373	5028
Earnings	5362	5172	475	2082	4254	6654	11348	4573
Mixed	3493	16805	-68	1131	2931	6164	9803	5032
F: Agriculture and Mining (N=95)								
Profits	4063	20264	-4635	363	2434	5515	10063	5151
Net Rev.	5546	7623	526	1067	3257	6639	14099	5572
Earnings	9836	28547	230	669	2422	7358	21745	6689
Mixed	6482	20758	102	727	2543	6493	13767	5766

Table B.2: Complementing Table 3.

Table B.2a: Correlations between the Enterprise Income Measures (CILSS)					
Measured Correlation	Food Commerce	Non-Food Commerce	Manufact.	Services	
<u>A: Numerical Correlation</u>					
Profit and Net Rev.	.387	.143	.272	.286	
Profit and Earnings	.431	.268	.599	.397	
Net Rev. and Earnings	.907	.177	.343	.731	
<u>B: Rank Correlation:</u> <u>Kruskal-Wallis Chi-Square Approximation Test Statistic^a</u>					
Variable	Ranking by				
Net Rev.	Profit	81.9 U	58.5 U	35.0 U	40.4 /
Earning	Profit	95.3 U	73.0 U	32.7 U	24.9 U
Profit	Net Rev.	13.8	14.5	19.1 /	13.2
Earning	Net Rev.	110.0 /	77.5 /	56.4 /	34.1 /
Profit	Earnings	12.1	20.5 /	7.3	13.4
Net Rev.	Earnings	101.8 /	80.2 /	58.5 /	33.5 /
<p>Note: ^a/ Critical values of the Chi-Square statistic are 14.68 (10 percent significance level), 16.92 (5 percent) and 21.67 (1 percent). The apparent pattern of the average rank score over the ten groups according to the variable by which the sample is ranked is also indicated: down (\), U-shaped (U), or up (/). Insignificant rank correlations are of course associated with no apparent pattern.</p>					

Table B.2b:
Correlations between the Enterprise Income Measures (GLSS)

<u>Measured Correlation</u>	<u>Commerce</u>	<u>Food Manuf.</u>	<u>Services</u>	<u>Other Manuf.</u>	<u>Textiles Manuf.</u>	<u>Agric & Mining</u>
<u>A: Pearson Correlation</u>						
Profit and Net Rev.	-.294	.058	-.176	.092	.035	.448
Profit and Earnings	-.008	-.016	-.104	-.374	-.028	.620
Net Rev. and Earnings	.197	.349	.402	.351	.515	.333

B: Rank Correlation:
Kruskal-Wallis Chi-Square Approximation Test Statistic*

<u>Variable</u>	<u>Ranking by</u>						
Net Rev.	Profit	394.9 U	116.3 U	102.2 U	124.6 U	32.3 U	33.6 U
Earning	Profit	183.5 U	68.8 U	95.2 U	83.7 U	17.9 U	31.3 U
Profit	Net Rev.	41.5 \	18.9 U	12.2	17.9 /	14.3 /	28.2 /
Earning	Net Rev.	267.1 /	87.7 /	82.4 /	89.7 /	22.4 /	52.2 /
Profit	Earnings	27.7 \	4.7	12.7	11.7	11.9	14.6
Net Rev.	Earnings	288.9 /	96.7 /	90.5 /	85.1 /	30.9 /	51.0 /

Note: */ Critical values of the Chi-Square statistic are 14.68 (10 percent significance level), 16.92 (5 percent) and 21.67 (1 percent). The apparent pattern of the average rank score over the ten groups according to the variable by which the sample is ranked is also indicated: down (\), U-shaped (U), or up (/). Insignificant rank correlations are of course associated with no apparent pattern.

Table B.4: Complementing Table 5.

Table B.4a: Relative Magnitudes of Enterprise Income Measures (CILSS)				
Relative Magnitude	Food Commerce	Non-Food Commerce	Manufact.	Services
<u>P=Profits, N=Net Revenue:</u>				
P < 0 < N	46.0	38.2	18.0	14.6
P > 0, and: N > 3P	10.7	7.5	9.9	7.3
1.5P < N < 3P	12.1	11.8	9.9	16.4
N < 1.5P, P < 1.5N	18.8	21.5	31.5	34.6
1.5N < P < 3N	7.7	11.8	13.5	16.4
P > 3N	3.7	7.0	14.4	9.0
P = 0 or N = 0	1.1	2.2	2.7	1.8
<u>P=Profits, E=Earnings:</u>				
P < 0 < E	46.3	38.7	18.9	14.6
P > 0, and: E > 3P	23.9	17.8	13.5	20.0
1.5P < E < 3P	17.3	14.5	13.5	10.9
E < 1.5P, P < 1.5E	9.2	17.2	20.7	34.6
1.5E < P < 3E	1.8	4.3	13.5	12.7
P > 3E	.7	7.5	18.9	7.3
P = 0 or N = 0	.7	.0	.9	.0
<u>N=Net Revenue, E=Earnings:</u>				
N > 3E	3.3	7.5	7.2	9.1
1.5E < N < 3E	6.3	7.5	17.1	9.1
N < 1.5E, E < 1.5N	23.9	33.9	38.7	27.3
1.5N < E < 3N	30.2	22.6	25.2	20.0
E > 3N	34.6	26.3	8.1	32.7
N = 0 or E = 0	1.8	2.1	3.6	1.8

Table B.4b:
Relative Magnitudes of Enterprise Income Measures (GLSS)

Relative Magnitude	Commerce	Food Manufact.	Services	Other Manufact.	Textiles Manufact.	Agric. & Mining
<u>P=Profits, N=Net Revenue:</u>						
P < 0 < N	62.7	56.0	34.7	24.9	28.2	16.8
P > 0, and:						
N > 3P	7.2	8.1	11.7	10.6	13.7	9.5
1.5P < N < 3P	6.3	7.5	9.9	14.3	14.5	22.1
N < 1.5P, P < 1.5N	10.9	14.4	24.1	26.4	28.2	23.2
1.5N < P < 3N	5.0	8.1	9.9	12.1	9.7	13.7
P > 3N	6.6	5.8	7.3	10.2	3.2	13.7
P = 0 or N = 0	1.3	.2	2.6	1.5	2.4	1.1
<u>P=Profits, E=Earnings:</u>						
P < 0 < E	60.8	55.2	34.3	25.3	29.8	14.7
P > 0, and:						
E > 3P	9.6	11.4	14.2	14.0	16.1	11.6
1.5P < E < 3P	5.2	6.9	13.1	15.1	17.7	12.6
E < 1.5P, P < 1.5E	7.1	11.8	20.8	20.8	16.1	23.2
1.5E < P < 3E	4.5	6.4	8.4	7.2	9.7	13.7
P > 3E	7.6	7.2	5.5	14.7	6.5	20.0
P = 0 or N = 0	5.3	1.1	3.7	3.0	4.0	4.2
<u>N=Net Revenue, E=Earnings:</u>						
N > 3E	16.5	12.6	11.3	16.6	12.1	13.7
1.5E < N < 3E	18.1	15.9	13.9	17.0	18.6	24.2
N < 1.5E, E < 1.5N	24.1	31.5	34.7	30.2	25.0	35.8
1.5N < E < 3N	16.6	17.8	17.5	15.9	25.8	5.3
E > 3N	18.4	21.0	16.8	15.9	12.1	15.8
N = 0 or E = 0	6.4	1.4	5.8	4.5	6.5	5.3

Table B.5: Complementing Table 6.

Earning/Total Revenue Ratio	Food Commerce	Non-Food Commerce	Manufact.	Services
0.0 - 0.4	10.3	16.1	28.8	20.0
0.4 - 0.8	17.3	16.1	15.3	21.8
0.8 - 1.2	34.2	36.5	26.1	25.5
1.2 - 2.0	17.6	18.3	19.8	16.4
2.0 - 5.0	14.3	7.5	8.1	9.1
> 5.0	6.3	5.4	1.8	7.3

Earning/Total Revenue Ratio	Commerce	Food Manuf.	Services	Other Manuf.	Textiles Manuf.	Agric. & Mining
0.0 - 0.4	44.8	37.6	21.5	31.0	21.8	35.8
0.4 - 0.8	17.5	21.2	23.0	17.7	17.7	15.8
0.8 - 1.2	12.6	12.6	21.2	14.7	12.9	14.7
1.2 - 2.0	8.7	15.4	14.6	18.1	18.5	13.7
2.0 - 5.0	10.7	10.1	13.9	13.2	25.0	12.6
> 5.0	5.7	3.2	5.8	5.3	4.0	7.4

Table B.6: Complementing Table 7.

Net Revenue/Total Revenue Ratio	Food Commerce	Non-Food Commerce	Manufact.	Services
0.0 - 0.4	32.4	37.1	28.8	36.4
0.4 - 0.8	35.6	25.8	32.4	27.3
0.8 - 1.2	23.5	24.7	27.9	21.8
1.2 - 2.0	5.1	5.9	4.5	9.7
2.0 - 5.0	2.6	2.7	5.4	3.6
> 5.0	.7	3.8	.9	1.8

Net Revenue/Total Revenue Ratio	Commerce	Food Manuf.	Services	Other Manuf.	Textiles Manuf.	Agric. & Mining
0.0 - 0.4	42.2	42.7	21.5	25.6	16.1	22.1
0.4 - 0.8	24.1	24.9	25.9	23.4	20.2	16.8
0.8 - 1.2	12.4	14.0	22.6	23.0	30.6	27.4
1.2 - 2.0	10.3	11.8	19.7	15.1	18.5	24.2
2.0 - 5.0	9.0	5.6	9.1	10.9	11.3	6.3
> 5.0	2.0	.9	1.1	1.9	3.2	3.2

Table B.7: Complementing Table 8.

	Food Commerce	Non-Food Commerce	Manufacturing	Services
No Expenditures Reported %	.0	2.2	16.2	21.8
One Input Item Exceeding Reported Total Revenue %	40.8	31.7	15.3	7.3
Value of Inputs Reportedly Shared ^a	81738	180970	21303	56837
(% of Total Expenditures)	(63.2)	(46.6)	(34.3)	(36.3)
Value of Inputs Identified As Being Shared ^a	1408	750	52	99

Note: ^aMean value per enterprise

	Commerce	Food Manuf.	Services	Other Manuf.	Textiles Manuf.	Agric. & Mining
No Expenditures Reported %	1.8	1.5	15.7	21.9	7.3	58.3
One Input Item Exceeding Reported Total Revenue %	58.2	48.1	25.6	20.7	21.0	16.7
Value of Inputs Reportedly Shared ^a	48143	19769	33004	2062	2217	3692
(% of Total Expenditures)	(66.6)	(54.2)	(68.1)	(12.6)	(27.3)	(50.6)
Value of Inputs Identified As Being Shared ^a	64	44	0	0	0	0

Note: ^aMean value per enterprise

Table B.8: Complementing Table 10.

Table B.8a: Rank Correlations between Enterprise Income Variables and Measures of Enterprise Size (CILSS)					
Ranked by	Profit	Net Rev.	Earnings	Capital	Family Hours
<u>A: Food Commerce</u>					
Capital Stock	19.1 ^b	35.0 ^a	40.4 ^a	.	21.9 ^a
Family Hours	11.4	38.2 ^a	58.7 ^a	19.0 ^b	.
<u>B: Non-Food Commerce</u>					
Capital Stock	6.0	52.6 ^a	57.0 ^a	.	46.2 ^a
Family Hours	10.0	37.6 ^a	53.1 ^a	30.7 ^a	.
<u>C: Manufacturing</u>					
Capital Stock	5.2	21.1 ^b	19.8 ^b	.	11.6
Family Hours	10.7	23.2 ^a	37.8 ^a	8.5	.
<u>D: Services</u>					
Capital Stock	6.2	19.1 ^b	27.0 ^a	.	20.3 ^a
Family Hours	12.5	10.7	20.9 ^b	20.7 ^b	.

Notes: ^aSignificant at 1 percent
^bSignificant at 5 percent

Table B.8b:
Rank Correlations between Enterprise Income Variables and
Measures of Enterprise Size (GLSS)

Ranked by	Profit	Net Rev.	Earnings	Capital	Family Hours
<u>A: Commerce (GLSS)</u>					
Capital Stock	4.8	153.1 ^a	76.2 ^a	.	117.1 ^a
Family Hours	23.5 ^a	170.0 ^a	139.8 ^a	95.8 ^a	.
<u>B: Food Manufacturing (GLSS)</u>					
Capital Stock	13.2	72.7 ^a	50.3 ^a	.	28.1 ^a
Family Hours	11.4	71.1 ^a	61.7 ^a	39.3 ^a	.
<u>C: Services (GLSS)</u>					
Capital Stock	3.4	70.6 ^a	45.6 ^a	.	35.3 ^a
Family Hours	7.7	58.2 ^a	68.8 ^a	27.8 ^a	.
<u>D: Other Manufacturing (GLSS)</u>					
Capital Stock	5.9	54.1 ^a	47.6 ^a	.	41.1 ^a
Family Hours	15.0 ^c	66.3 ^a	79.0 ^a	39.1 ^a	.
<u>E: Textiles Manufacturing (GLSS)</u>					
Capital Stock	11.3	9.3	7.3	.	13.6
Family Hours	6.1	16.4 ^c	23.4 ^a	16.7 ^c	.
<u>F: Agriculture and Mining (GLSS)</u>					
Capital Stock	15.1 ^b	39.7 ^a	33.6 ^a	.	6.2
Family Hours	10.8	11.5	15.6 ^c	8.2	.

Notes: ^aSignificant at 1 percent
^bSignificant at 5 percent
^cSignificant at 10 percent

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