NOTES ON BASIC FEATURES OF THE RURAL BORROWERS OF FINANCIERA CALPIA IN EL SALVADOR

by

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Table of Contents

List of Tables

1. Introduction{tc \l1 "1. Introduction}

In May 1998, the BASIS Research Program in El Salvador implemented a survey of the rural borrowers of Financiera Calpiá. To create a sampling framework, Calpiá gave the research team a list of all its borrowers, past and present, who lived in cantones.[1] An effective sampling of 241 borrowers were interviewed.

This is one of two companion notes. The first note listed reasons to undertake research on the rural borrowers of Calpiá, explained how the survey attempted to answer the questions it posed, and described the data to be collected to address these questions (Schreiner, Gonzalez-Vega, Beneke de Sanfeliú and Shi, 1998). The first note also listed the strong points of the methods used, and it described how the sample was drawn.

This second note illustrates the methodological issues raised in the first note, and it describes some of the traits of the population of rural borrowers of Calpiá. This description is based on the complete, known population of borrowers, thanks to the kindness of Calpiá in the supply of data on each one of its rural borrowers. Beyond this introduction, the note also checks on how well the sample represents the population as a whole. Finally, the note shows how some interesting results can be obtained even from the limited information available for the sampling framework.

2. What are basic features of the population?{tc \l1 "2. What are basic features of the population?}

2.1 The three data sets{tc \l2 "2.1 The three data sets}

This section describes basic features of the rural borrowers of Financiera Calpiá on the basis of data from the population, a super-sample, and the effective sample resulting from the survey. This comparison makes it possible to verify how well the sample represents the population. In the super-sample of 321 borrowers, the primary group in the sample had 241 cases and the substitute group had 80 cases. After the field work, 211 interviews were conducted with borrowers in the original primary group and 30 corresponded to substitutes.

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[1] El Salvador is divided into 14 departamentos, 262 municipios, hundreds of cantones, and thousands of caseríos. Each departamento and each municipio has a capital (cabecera). Rural was defined as residence in a cantón that is not carecera de municipio. The sampling process is discussed in Schreiner, Gonzalez-Vega, Beneke, and Shi (1998).

The population are the 4,789 borrowers in the history of Calpiá who lived at the time of their most recent loan in *cantones* that are not a *cabecera de municipio*.[2] This section describes the population based on a few variables gleaned for the April 1998 list used to draw the sample.

These numbers for the population are not statistics but parameters. They do not have standard errors since they come from the whole population. Statistical significance is not an issue. For example, the median amount disbursed on the most recent loan to non-agricultural borrowers is not an estimate of the median but rather the median itself. The next section will compare the population parameters with their estimates from the sample.

2.2 Variables known for the population as a whole{tc \l2 "2.2 Variables known for the population as a whole}

Calpiá made a list of all borrowers who lived in *cantones* to help the BASIS researchers draw the sample. The list included the amount disbursed for the most recent loan as well as the few variables needed to divide the population in strata (Schreiner, Gonzalez-Vega, Beneke and Shi, 1998). The fields in the file provided to the researchers include:

- A number unique to each borrower as the key to the list;
- The *departamento*, *municipio*, *cantón*, and *caserío* for the residence;
- The *departamento*, *municipio*, *cantón*, and *caserío* for the farm or business;
- The loan officer responsible for the borrower;
- Whether the borrower had any debt outstanding as of April 1998;
- The date of disbursement of the first loan to the borrower;
- The total number of loans disbursed to the borrower in his or her lifetime;
- The amount of *colones* disbursed for the most recent loan;
- The sector listed by the borrower for the use of the loan.

These variables are analyzed below. The combinations of the three strata for the population, super-sample, and sample were already analyzed in Schreiner, Gonzalez-Vega, Beneke and Shi (1998). These strata classify the sample into active and inactive borrowers, new and repeat borrowers, and clients with loans for crops, livestock, and non-agricultural purposes.

2.2.1 Place of residence and place of business{tc \l3 "2.2.1 Place of residence and place of business}

[2] From the list of 5,558 borrowers living in cantones provided by Calpiá, 382 borrowers living in "urban" cantones, 5 borrowers who tested the instrument, and 382 borrowers whose first loan was in 1998 were excluded, to arrive at a sampling framework of 4,789.

The distribution of the 4,789 rural borrowers by *departamento* of residence is shown in Table 1. The first column lists the *departamento*. The second column lists the number of rural borrowers of Calpiá who live in that *departamento*.

The third column in Table 1 is labeled *p.d.f.* for probability density function. The p.d.f. tells what proportion of the population lives in a given *departamento*. For example, the probability that a Calpiá rural borrower drawn at random would live in La Libertad is about 42 percent. This is the ratio of the borrowers who live in La Libertad (1,992) to the borrowers in the population (4,789).

The fourth column is labeled *c.d.f.* for cumulative probability density function. The c.d.f. tells what proportion of the population lives in a given *departamento* or in any *departamento* already listed in the table. For example, about 79 percent of the population of rural borrowers of Calpiá live in either Ahuachapán, Sonsonate, or La Libertad. Thus, about four-fifths of the rural borrowers of Calpiá are in three of the 14 *departamentos* of El Salvador. Two-thirds come from La Libertad and Sonsonate alone.

Table 1: Distribution of rural borrowers by *departamento* of residence

	Rural borrowers Calpiá			All rural households			p.d.f. Calpiá/	Market
Departamento	Freq.	p.d.f.	c.d.f	Freq.	p.d.f.	c.d.f.	p.d.f. All rural	penetration
1. La Libertad	1,992	0.42	0.42	52,934	0.12	0.12	3.5	0.038
2. Sonsonate	1,092	0.23	0.64	38,132	0.09	0.20	2.7	0.029
3. Ahuatchapán	684	0.14	0.79	34,065	0.08	0.28	1.9	0.020
4. La Paz	325	0.07	0.85	29,007	0.07	0.35	1.0	0.011
5. Santa Ana	206	0.04	0.90	44,966	0.10	0.45	0.4	0.005
6. Chalatenango	193	0.04	0.94	25,838	0.06	0.50	0.7	0.007
7. San Miguel	122	0.03	0.96	33,618	0.08	0.58	0.3	0.004
8. Cuscatlán	111	0.02	0.99	19,304	0.04	0.62	0.5	0.006
9. San Vicente	33	0.01	0.99	17,364	0.04	0.66	0.2	0.002
10. San Salvador	31	0.01	1.00	45,491	0.10	0.76	0.1	0.001
11. Cabañas	0	0.00	1.00	14,193	0.03	0.80	0.0	0.000
12. Usulután	0	0.00	1.00	31,481	0.07	0.87	0.0	0.000
13. Morazán	0	0.00	1.00	21,603	0.05	0.91	0.0	0.000
14. La Unión	0	0.00	1.00	38,021	0.09	1.00	0.0	0.000
Total	4,789	1.00	1.00	446,017	1.00	1.00	NA	0.011

Source: Authors' calculations with data from Calpiá and from Ministerio de Economia (1995).
The probability density function (p.d.f.) tells the proportion in a class.
The cumulative density function (c.d.f.) tells the proportion in all classes already listed.

Outside of San Salvador, La Libertad and Sonsonate are two of the most densely populated *departamentos* in the country. They are near San Salvador, were not battle zones during the civil war, and their agriculture tends to be less risky and more productive than in other areas due to good

soils and irrigation. In fact, Calpiá chose to start rural loans in these areas due to the low risk of their agriculture. In contrast, Calpiá has 33 borrowers or less in two of the 14 *departamentos* and no borrowers at all in four *departamentos*. These are among the *departamentos* with the highest proportion of poor households in the country.

Table 2 shows the proportion of rural households in each *departamento* living in poverty. The absolute poor do not generate enough per capita income to buy the basic food basket; the relative poor generate per capita incomes below twice the cost of the basic food basket. This defines the poverty line. Information for 1997 come from the periodic household survey, *Encuesta de Hogares de Propósitos Múltiples* (Ministerio de Economía, 1998).

Table 2: Shares of the absolute poor, relative poor, and non-poor in the rural and in the total population, 1997, and population density, by departamento (percentages and in habitants per squared kilometer)

	Rural			Total			
Departamento	absolute poor	relative poor	non-poor	absolute poor	relative poor	non-poor	population density
1. La Libertad	15.1	31.8	53.0	10.9	26.4	62.7	311
2. Sonsonate	17.9	41.1	41.0	17.3	36.1	46.6	303
3. Ahuatchapán	28.3	35.4	36.3	25.4	35.0	39.6	211
4. La Paz	24.6	31.6	43.9	24.1	30.3	45.5	201
5. Santa Ana	21.4	34.3	44.3	17.5	33.6	48.9	227
6. Chalatenango	35.2	30.6	34.2	32.9	31.0	36.1	89
7. San Miguel	31.8	34.7	33.5	24.7	31.8	43.5	194
8. Cuscatlán	29.8	33.2	36.9	24.3	34.3	41.4	226
9. San Vicente	36.5	36.6	26.9	31.0	34.9	34.1	121
10. San Salvador	17.9	32.5	49.6	8.0	24.2	67.7	1,705
11. Cabañas	62.2	24.8	13.0	45.3	29.2	25.5	125
12. Usulután	31.7	37.9	30.3	26.4	36.4	37.2	146
13. Morazán	45.5	31.4	23.0	40.4	31.3	28.3	111
14. La Unión	36.9	31.1	32.0	33.4	32.0	34.6	123
Total	27.8	33.7	38.5	18.4	29.6	52.0	243

Source: Ministerio de Economia (1998).
Note: The cost of the basic food basket was computed at 6.24 colones per person per day. Those whose income per capital cannot buy the basic basket are absolutely poor. Those whose income per capita is less than twice the cost of the basic basket are relatively poor.

From this perspective, La Libertad, where most of Calpiá's rural lending takes place, is the *departamento* with the lowest share of the poor among its rural population (47 percent). Sonsonate with 59 percent of its rural population below the poverty line, ranks fifth. At the other extreme,

Cabañas (87 percent of households below the poverty line), Morazán (77 percent), and San Vicente (73 percent), where poverty is deep, are *departamentos* where Calpiá does not reach rural borrowers yet (Lardé de Palomo, 1999).

Table 1 also shows the number of rural households in each *departamento* according to the 1994 population census (column 5), the proportion of the country's rural population in each *departamento* (column 6), and the corresponding cumulative density function (column 7). The largest rural population (52,934) corresponds to La Libertad, where 12 percent of all rural households in the country live. San Salvador and Santa Ana are the two other *departamentos* with the largest number of rural households. One-third of all rural households are in these three *departamentos.* The four poor departamentos where Calpiá does not have rural clients account for 24 percent of all rural households.

The rural clientele of Calpiá is not evenly distributed over the country. The proportion of rural borrowers who live in La Libertad is 3.5 times the proportion of the country's rural households in this *departamento* (column 8). This proportion is 2.7 times in Sonsonate and 1.9 times in Ahuachapán. Given the concentration of its clientele in these three *departamentos*, the proportion of Calpiá clients does not exceed the proportion of rural households in any other *departamento* (columns 3 and 6).

Despite the concentration of Calpiá's lending in La Libertad, the financiera only reaches 3.8 percent of the rural households in this *departamento*. Column 9 in Table 1 shows these market penetration ratios, which are even lower in other *departamentos*. For the country as a whole, the penetration of Calpiá is 1.1 percent of all rural households.[3] Although small, this market penetration is significant. Given the unusually low access to formal credit by the rural population of El Salvador (World Bank, 1997).

2.2.2 Branches{tc \l3 "2.2.2 Branches}

Table 3 shows the distribution of its rural borrowers by Calpiá's branch. More than half of them are served out of one branch, Santa Tecla. About 84 percent of its borrowers are in Santa Tecla and Sonsonate. Seven other branches reach a handful of rural borrowers and none are served out of mejicanos.

There is no reason to expect Calpiá to serve all *departamentos* in the same way, nor that all branches should have the same number of rural borrowers. Calpiá is young, and it had to start somewhere. Furthermore, wealth, population, and creditworthiness are not equal across all

[3] This market penetration is overstated to the extent to which population has increased since 1994. The rural population has shown, however, much less dynamism than the urban population (Lardé de Palomo, 1999).

departamentos. Still, the distribution of rural borrowers by branch and by *departamento* suggests some key questions for further work.

Table 3: Distribution of rural borrowers by branch

		Population			Sample		
Branch	Departamento	Freq.	p.d.f.	c.d.f.	Freq.	p.d.f.	c.d.f.
1. Santa Tecia	La Libertad	2,467	0.52	0.52	145	0.60	0.60
2. Sonsonate	Sonsonate	1,567	0.33	0.84	58	0.24	0.84
3. Apopa	San Salvador	335	0.07	0.91	18	0.07	0.92
4. Soyapando	San Salvador	135	0.03	0.94	2	0.01	0.93
5. Santa Ana	Santa Ana	125	0.03	0.97	11	0.05	0.97
6. San Miguel	San Miguel	101	0.02	0.99	2	0.01	0.98
7. Cojutepeque	Cuscatlán	33	0.01	0.99	2	0.01	0.99
8. Usulután	Usulután	20	0.00	1.00	2	0.01	1.00
9. Centro	San Salvador	6	0.00	1.00	1	0.00	1.00
10. Mejicanos	San Salvador	0	0.00	1.00	0	0.00	1.00
Total		4,789	1.00	1.00	241	1.00	1.00

Source: Authors' calculations with data from Calpiá.

On the one hand, if the six *departamentos* with few rural borrowers have fewer people per square kilometer and less wealth than the two *departamentos* with most of the rural borrowers, as is shown in Table 2, then it may be that the lending technology of Calpiá cannot reach very rural borrowers.[4]

On the other hand, growth takes time. Perhaps the branches and the *departamentos* without many rural borrowers now will have as many as La Libertad and Sonsonate once Calpiá has had time to grow. No one knows yet. Still, Calpiá suspects that the virgin markets may be more difficult than the earlier locations. After all, Calpiá chose to go first to the areas where they thought they would have the best chance for success. For example, Calpiá hedged its bets for the ability to pay of borrowers by working first with farmers with strong links with CENTA, the government extension service. Likewise, Calpiá improved the odds that borrowers would be willing to pay by working first in areas with few NGOs that make loans and in areas that were not battle zones. Moreover, learning and further development of the lending technology at the original sites will help to lower the costs of lending the thereby facilitate outreach in more difficult locations.

[4] The figures and density of population by *departamento* shown in Table 2 refer to the total and not just the rural population.

2.2.3 Loan officers{tc \l3 "2.2.3 Loan officers}

Table 4: Distribution of rural borrowers among loan officers

	Population			Sample		
Loan officer	Freq.	p.d.f.	c.d.f	Freq.	p.d.f	c.d.f
1	500	0.10	0.10	34	0.14	0.14
2	463	0.10	0.20	26	0.11	0.25
3	417	0.09	0.29	30	0.12	0.37
4	393	0.08	0.37	12	0.05	0.42
5	381	0.08	0.45	22	0.09	0.51
6	354	0.07	0.52	14	0.06	0.57
7	325	0.07	0.59	12	0.05	0.62
8	235	0.05	0.64	15	0.06	0.68
9	235	0.05	0.69	12	0.05	0.73
10	203	0.04	0.73	3	0.01	0.75
11	172	0.04	0.77	10	0.04	0.79
12	134	0.03	0.80	12	0.05	0.84
13	104	0.02	0.82	13	0.05	0.89
14	85	0.02	0.84	1	0.00	0.90
15	75	0.02	0.85	1	0.00	0.90
16	69	0.01	0.87	0	0.00	0.90
17	59	0.01	0.88	5	0.02	0.92
18	50	0.01	0.89	1	0.00	0.93
19	47	0.01	0.90	1	0.00	0.93
20	45	0.01	0.91	3	0.01	0.94
21	43	0.01	0.92	1	0.00	0.95
22	41	0.01	0.93	2	0.01	0.95
23	41	0.01	0.93	2	0.01	0.96
24	40	0.01	0.94	2	0.01	0.97
25	25	0.01	0.95	1	0.00	0.98
All others	253	0.05	1.00	6	0.02	1.00
Total	4,789	1.00	1.00	241	1.00	1.00

Source: Author's calculations with data from Calpiá.

At the time of the survey, Calpiá had 25 rural loan officers, who had some expertise in agriculture. As a rule of thumb, they worked with borrowers who live more than 20 kilometers from a branch. Table 4 shows the distribution of Calpiá's rural borrowers among its loan officers.

The number of rural borrowers per loan officer ranged from 25 to 500. In principle, this is an indicator of loan officer productivity. Compared to international standards, over 200 rural borrowers per loan officer shows high productivity (MicroBanking Bulletin, 1999). At least ten of Calpiá's rural loan officers achieved these levels of productivity.

It cannot be inferred, however, that the productivity of the other loan officers is not high as well. Many of them work with additional borrowers who were not classified as rural for the purposes of this study. A few had only recently joined Calpiá and were only beginning to develop their portfolio. The productivity of Calpiá's loan officers in general is very high (Navajas, 1999; Peitéz, 1999).

The concentration of Calpiá's rural borrowers in the portfolios of a few loan officers is also high. Six loan officers managed more than half of the *financiera's* rural clientele (column 4 in Table 4). This concentration increases the importance of these loan officers, who embed most of the organization's learning in this market niche.

2.2.4 Year of disbursement of the first loan{tc \l3 "2.2.4 Year of disbursement of the first loan}

Table 5: Distribution of rural borrowers by year of first disbursement

	Population			Sample		
Year	Freq.	p.d.f.	c.d.f	Freq.	p.d.f	c.d.f
1992	3	0.00	0.00	1	0.00	0.00
1993	12	0.00	0.00	2	0.01	0.01
1994	332	0.07	0.07	20	0.08	0.10
1995	1,313	0.27	0.35	53	0.22	0.32
1996	1,366	0.29	0.63	52	0.22	0.53
1997	1,763	0.37	1.00	113	0.47	1.0
Total	4,789	1.00	1.00	241	1.00	1.00

Source: Author's calculations with data from Calpiá.

Financiera Calpiá did not always have a mission to serve rural areas. It first developed as a successful urban microlender. It did not start to attempt to reach rural borrowers with a credit technology tailored to rural cash flows, rural guarantees, and rural signals of creditworthiness until September of 1994. This is reflected in Table 5. In the years before the start of the rural program, from 1992 to 1994, Calpiá made 347 first-time loans to borrowers who lived in *cantones*. In the first year of the rural program, in 1995, new rural borrowers received 1,313 first-time loans. This number

increased to 1,366 in 1996 and to 1,763 in 1997. Rural borrowers reached for the first time in 1998 were excluded from the study. The figures reported here reflect a very rapid growth of the *financiera's* rural clientele.

2.2.5 Number of loans per borrower{tc \l3 "2.2.5 Number of loans per borrower}

The number of loans to a borrower in his or her lifetime is the *sequence*. For new borrowers, the sequence is one. For the rural borrowers of Calpiá, the sequence is as high as 44. About 95 percent of the borrowers, however, had 7 loans or less (Table 6).

Repeated use is a simple measure of the worthwhileness of a loan from the point of view of the borrower (Schreiner, 1997). Given the numbers in Table 6, (4,789-1,543)/4,789=0.68), over two-thirds of the rural borrowers of Calpiá liked their first loan enough to ask for a second one. This estimate of repeat borrowers is biased downward since some new borrowers now will repeat in the future. The figure for repeated use at Calpiá compares well with the estimated figures for five well-regarded microfinance organizations (MFOs) in Bolivia. For the urban MFOs, BancoSol, Caja los Andes, and FIE, the numbers are 93 percent, 89 percent, and 82 percent respectively (Gonzalez-Vega *et al.*, 1998). For the rural MFOs, PRODEM and Sartawi, the numbers are 67 percent and 88 percent.[5]

Table 6: Distribution of rural borrowers by number of lifetime loans

	Population			Sample		
Sequence	Freq.	p.d.f.	c.d.f	Freq.	p.d.f	c.d.f
1	1,543	0.32	0.32	89	0.37	0.37
2	1,262	0.26	0.59	53	0.22	0.59
3	757	0.16	0.74	42	0.17	0.76
4	433	0.09	0.83	19	0.08	0.84
5	254	0.05	0.89	14	0.06	0.90
6	157	0.03	0.92	5	0.02	0.92
7	113	0.02	0.94	4	0.02	0.94
8-10	155	0.03	0.98	9	0.04	0.98
11 or more	115	0.02	1.00	6	0.02	1.00
Total	4,789	1.00	1.00	241	1.00	1.00

Source: Author's calculations with data from Calpiá.

[5] The estimates for the Bolivian MFOs are also biased downward since a big part of their portfolios were new borrowers who had not yet had the chance to drop out.

The proportion of repeat borrowers for Calpiá was reached with rural borrowers and in a country scarred by war and without a culture of repayment due to loan-forgiveness programs of the government. Also, perhaps Calpiá is willing to make longer loans sooner in the sequence than are the urban lenders in Bolivia. If so, this would depress the measure of repeat use reported here. Not only do many borrowers take a second loan but, as shown below, they sustain their relationships with the organization.

Table 6 also shows that more than half of the borrowers of Calpiá had had only one or two loans at the time of the survey. That this, the proportion of new or almost-new borrowers in the rural portfolio was high. This suggested a rapid recent growth in the number of rural clients. According to the figures in Table 5, the number of new rural borrowers had grown a rate of more than 100 percent each year.

a high proportion of new or almost-new borrowers has important implications for the structure of costs and risks of the organization. If it is more expensive to screen new compared to established borrowers and if their loan size is smaller, the average costs of lending will be higher than for a mature portfolio. These average costs are expected to decline with the sequence, while the larger loan size increases the organization's earning capacity.. Risks are also higher for new borrowers, given more acute information deficiencies and the lower value of the not-yet-established client relationship. Monitoring and contract enforcement are thereby more expensive.

Calpiá was able to absorb these higher costs and risks because it built its rural portfolio on its already successful urban portfolio. This allowed the *financiera* to dilute its fixed costs better and to counter risk through portfolio diversification.

Table 7: Retention of borrowers through time

			1994		1995		1996		1997	
		1992-93	I	II	I	II	I	II	I	II
a. Inactive	Data	4	19	113	423	347	436	225	392	158
b. Active	Data	11	37	163	269	274	332	373	550	663
c. Retention	b/(a+b)	0.73	0.66	0.59	0.39	0.44	0.43	0.62	0.58	0.81
d. Inactive accum.	a(t)+a(t-1)	4	23	136	559	906	1,342	1,567	1,959	2,117
e. Active accum.	b(t)+b(t-1)	11	48	211	480	754	1,086	1,459	2,009	2,672
f. Retention accum.	e/(d+e)	0.73	0.68	0.61	0.46	0.45	0.45	0.48	0.51	0.56

Source: Author's calculations with data from Calpiá.

Table 7 reports Calpiá's retention of borrowers through time. The retention indicator is computed as the ratio of active borrowers over total (active and inactive) borrowers. Retention ratios were computed for every semester through 1997.

Retention declined in 1995, but it improved afterwards. The historical (accumulated) retention ratio is also shown in Table 7, and it was 56 percent by the end of 1997. This ratio reflects

the comparison of all active borrowers to the sum of active and inactive clients up to the time of measurement.

The retention of Calpiá's borrowers is remarkable, given the fact that the organization is very strict in contract enforcement and the recent adverse shocks (El Niño) that have affected the rural economy. Retention in these circumstances reveals a high quality of service, at least compared to the limited options available to the rural population. Moreover, given Calpiñ's individual loan technology, it cannot be explained by peer pressure.

2.2.6 Sector of activity{tc \l3 "2.2.6 Sector of activity}

Table 8 shows the sector of business listed in the loan application. The rural borrowers of Calpiá work in these sectors, even if they do not always use the loan proceeds for the purpose stated in the application. More than three-fourths of all rural borrowers are in agriculture (56 percent in crops and 21 percent in livestock). About 15 percent are in commerce, and industry and services both account for about four percent. Thus, non-agricultural borrowers represent almost one-quarter of the total (Table 10). Calpiá does reach households with farms, and it must be that at least some of these households use at least part of their non-agricultural loans for agriculture. This result, which also occurs when agricultural loans are used, at least in part, for non-agricultural purposes is the inevitable consequence of the fungibility of funds (Von Pischke and Adams, 198).

Fungibility is more likely when the household has multiple sources and multiple uses of funds and when there is no separation between the household and the enterprise (farm). Calpiá's lending technology privileges households with multiple sources of funds (diversified income portfolios) as a tool to facilitate repayment (Navajas, 1999).

Table 8: Distribution of rural borrowers by sector

	Population			Sample		
Sector	Freq.	p.d.f.	c.d.f	Freq.	p.d.f	c.d.f
1. Crops	2,669	0.56	0.56	168	0.70	0.70
2. Livestock	985	0.21	0.77	36	0.15	0.85
3. Agriculture	3,654	0.77	0.77	204	0.85	0.85
4. Commerce	721	0.15	0.15	24	0.10	0.95
5. Service	199	0.04	0.19	8	0.03	0.98
6. Industry	184	0.04	0.23	5	0.02	1.00
7. Non-agriculture	1,105	0.23	0.23	37	0.15	0.15
Total	4,789	1.00	1.00	241	1.00	1.00

Source: Author's calculations with data from Calpiá.

At this point, it is not known whether Calpiá has actually had success in outreach to farm households. It is not known whether it reaches just those farm households with some members employed in other activities. According to the BASIS rural household panel, households with non-agricultural employment are less poor than the typical rural households, while households with agricultural employment are more poor (Beneke de Sanfeliú and Shi, 1999). It may be that Calpiá reaches just truck farmers with strong links to urban markets and whose cash flows are more smooth and sure than the cash flows of a farmer distant from the city, who sows crops and then must wait for months before the harvest or who raises animals from birth to butcher (Gonzalez-Gonzalez, Gonzalez-Vega, and Navajas, 1999).

Even if Calpiá does reach remote farmers with large, risky, uneven, and intermittent cash flows, this does not mean that Calpiá makes a profit from these loans. It may be that rural losses are compensated by urban profits. Other parts of the research project should help to tell whether this is the case.

2.2.7 Amount of most recent disbursement{tc \l3 "2.2.7 Amount of most recent disbursement}

The amount of the most recent disbursement to a borrower usually depends on the sequence, as accumulated knowledge about the borrower's repayment habits helps overcome the lender's reluctance to grant larger loans. The distributions of amounts disbursed discussed below thus depend on the distribution of sequence among the borrowers.

2.2.7.1 Population{tc \l4 "2.2.7.1 Population}

Some measures of the distribution of the amount of the most recent disbursement for the population of rural borrowers of Calpiá are in line 1 of Table 9. The analysis of the distribution of the amount disbursed is more complex than the analyses so far of the distributions of borrowers by *departamento*, branch, loan officer, sequence, sector, and year of first loan. Although Calpiá does tend to disburse loans for amounts in even thousands or half-thousands of *colones*, the number of unique amounts disbursed is too great to be listed. Thus, Table 9 lists just a few key percentiles of the distribution. At the *n* percentile, *n* percent of the loans had smaller amounts. For example, the maximum loan is in the 100 percentile—all other loans were smaller. For loans at the 90 percentile, 10 percent of other loans were greater, and 90 percent were smaller.

The mean amount disbursed for the most recent loan was $651.[6] This is almost twice the median of $342 (¢3,000). The median is the 50 percentile, the point at which half the loans are greater

[6] The amounts in Table 9 have been rounded to three digits. Calpiá disburses loans not in dollars but in *colones*. Dollars are used here so as to compare with other lenders worldwide. The exchange rate was taken as 8.755 *colones* to the dollar. This rate has prevailed since June 1995. Between January 1992 and June 1995, the rate ranged between 8.1 and 9.2 (International Monetary Fund). The file supplied by Calpiá includes the date of the first disbursement but not of the most recent disbursement.

and half the loans are less. The fact that the mean exceeds the median suggests that the distribution is skewed. Big loans differ from the median loan more than do small loans. For example, the maximum loan ($45,700 or ¢400,000) is $45,358 more than the median (134 times larger), but the minimum loan ($57 or ¢500) is $285 less than the median. The median is six times larger than the minimum loan size. In general, skewness toward big loans means a big loan in the 50+*x* percentile pulls the mean further from the median than does a small loan in the 50-*x* percentile. In fact, in the case of *x*=50 for the rural borrowers of Calpiá, it would take about 160 loans of the minimum size to balance the effect on the mean of the one biggest loan.

Table 9: Distribution of the amount of the most recent disbursement by the basic strata for the population

Basic strata	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1. Population	4,789	1.00	1.00	651	45,700	1,370	685	342	238	114	57
2. Active	2,672	0.56	0.56	832	45,700	1,710	1,140	571	286	171	57
3. Inactive	2,117	0.44	1.00	422	5,140	914	457	228	171	69	57
4. Crops	2,699	0.56	0.56	470	6,850	1,140	571	286	171	114	57
5. Livestock	985	0.21	0.77	888	5,140	1,710	1,140	685	343	228	57
6. Non-ag	1,105	0.23	1.00	882	45,700	1,710	914	457	286	171	57
7. New	541	0.20	0.20	1,080	22,800	2,280	1,140	571	343	286	91
8. Repeat	2,131	0.80	1.00	770	45,700	1,710	913	457	228	171	57
9. Inactive/Crops	1,638	0.34	0.34	354	3,080	1,140	400	28	114	102	57
10. Inactive/Livestock	238	0.05	0.39	786	5,140	1,600	1,140	571	343	183	57
11. Inactive/Non-ag	241	0.05	0.44	521	4,570	1,140	571	343	228	114	57
12. Active/Crops/New	133	0.03	0.47	775	3,080	2,280	1,140	571	343	228	114
13. Active/Crops/Repeat	928	0.19	0.66	629	6,850	2,280	685	400	228	114	57
14. Active/Livestock/New	141	0.03	0.69	1,260	4,570	2,280	1,710	1,140	571	343	228
15. Active/Livestock/Repeat	606	0.13	0.82	843	5,140	1,710	1,140	571	343	228	57
16. Active/Non-ag/New	267	0.06	0.88	1,130	22,800	2,280	1,140	571	343	228	91
17. Active/Non-ag/Repeat	597	0.12	1.00	916	45,700	1,710	914	457	285	171	57

Source: Authors' calculations with data from Calpiá.
Amounts in U.S. dollars.

Table 10: Unweighted distribution of the amount of the most recent disbursement for the super-sample

Basic strata	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1. Super-sample	321	1.00	1.00	651	3,430	1,710	685	400	228	114	57
2. Active	225	0.70	0.70	725	3,430	1,710	914	457	285	171	57
3. Inactive	96	0.30	1.00	478	2,280	1,140	571	228	171	114	57
4. Crops	224	0.70	0.70	571	3,080	1,370	685	343	228	114	57
5. Livestock	46	0.14	0.84	867	3,430	2,280	1,030	571	343	228	57

Thus, no better conversion from nominal *colones* to constant dollars can be done.

6. Non-ag	51	0.16	1.00	811	2,510	1,710	1,140	571	286	171	57
7. New	79	0.35	0.35	842	2,860	1,940	1,140	571	343	228	114
8. Repeat	146	0.65	1.00	662	3,430	1,710	685	457	228	114	57
9. Inactive/Crops	67	0.21	0.21	441	2,280	1,140	571	228	114	102	57
10. Inactive/Livestock	13	0.04	0.25	540	1,140	1,030	800	571	228	114	57
11. Inactive/Non-ag	16	0.05	0.30	582	2,280	1,710	742	314	171	171	171
12. Active/Crops/New	55	0.17	0.47	718	2,860	1,710	914	457	286	228	114
13. Active/Crops/Repeat	102	0.32	0.79	577	3,080	1,370	685	400	228	114	57
14. Active/Livestock/New	5	0.02	0.80	1,100	1,710	1,710	1,710	1,140	571	343	343
15. Active/Livestock/Repeat	28	0.09	0.89	978	3,430	2,860	7,090	571	343	228	114
16. Active/Non-ag/New	19	0.06	0.95	1,140	2,510	2,280	1,710	1,140	571	343	228
17. Active/Non-ag/Repeat	16	0.05	1.00	653	1,170	1,600	971	571	257	171	57

Source: Authors' calculations with data from Calpiá.

Table 11: Weighted distribution of the amount of the most recent disbursement for the super-sample

Basic strata	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1. Super-sample	NA	NA	NA	637	3,430	1,710	800	400	228	114	57
2. Active	NA	NA	NA	771	3,430	1,710	1,140	571	286	171	57
3. Inactive	NA	NA	NA	468	2,280	1,140	571	228	171	114	57
4. Crops	NA	NA	NA	501	3,080	1,370	571	286	171	114	57
5. Livestock	NA	NA	NA	887	3,430	2,280	1,140	571	343	228	57
6. Non-ag	NA	NA	NA	751	2,510	1,710	1,140	571	286	171	57
7. New	NA	NA	NA	1,020	2,860	1,940	1,710	914	457	343	114
8. Repeat	NA	NA	NA	708	3,430	1,710	914	491	251	171	57

Source: Authors' calculations with data from Calpiá. Shaded cells differ from unweighted case.

This observation highlights the worth of the use of the median in contrast to the mean. Worldwide, $500 is a standard benchmark for microloans. The mean of rural loans from Calpiá is $150 more than this benchmark, but the median is about $150 less. The donors and governments who fund microfinance and who funded Calpiá in its first few years probably care more for the fact that most rural borrowers get loans for less than $500 than they care for the fact that the average loan was above $500. The median answers the relevant question better than the mean.

The distribution of the amount of the most recent disbursement changes through time. Calpiá learns more about how much it can lend to new borrowers, and it learns more about the creditworthiness of repeat borrowers. The proportion of new borrowers in the portfolio changes. Furthermore, new borrowers in 1995 differ from new borrowers in 1998 (Gonzalez-Vega *et al.*, 1996).

2.2.7.2 Active versus inactive{tc \l4 "2.2.7.2 Active versus inactive}

The means of the last loan disbursed for active and inactive borrowers ($832 and $422) far exceed the medians ($571 and $228) (lines 2 and 3 of Table 9). At the 90, 75, 50, and 25 percentiles, active borrowers got most recent loans about twice as big as did inactive borrowers. Furthermore, the dispersion of the distribution and its skewness toward big loans is greater for active borrowers.

While active borrowers received bigger most recent loans than inactive borrowers, the difference is not as big as expected. At least four reasons may explain why active borrowers are expected to have bigger loans. First, they tend to be repeat borrowers, further along the sequence. Calpiá knows more about the creditworthiness of repeat borrowers and so it can run the risk to lend more to them with additional sequence. Furthermore, repeat borrowers know more about their own strengths and thus can risk more debt (Jovanovic, 1982).

Second, active borrowers have more recent last loans than inactive borrowers. All else constant, Calpiá may increase the amount disbursed as time passes since it learns more about the rural market as a whole. Third, Calpiá may make smaller loans to borrowers who are also more likely to find its loans less worthwhile or to have less demand and who are thus more likely to become inactive. Of course, in this case the chain of cause-and-effect could run backwards. Fourth, borrowers who, for some reason, are being rationed more strictly and thus get smaller loans compared to their repayment capacity may be more prone to exit.[7] Likewise, borrowers with bigger loans may tend to demand repeat loans more since bigger loans carry lower effective interest rates, and they may have few other options. In contrast, more borrowers may be able to get small loans from informal alternatives.

The dispersion for active loans is higher in large part because active borrowers tend to be repeat borrowers. Loan size disperses with more loans to a single borrower because Calpiá tailors the loan better to the true level of creditworthiness. This level varies among borrowers. In contrast, new borrowers are not so well known to Calpiá. New borrowers may all tend to get small loans of like amounts, regardless of what their true repayment strength might turn out to be once they are better-known.

2.2.7.3 Crops, livestock, and non-agriculture{tc \l4 "2.2.7.3 Crops, livestock, and non-agriculture}

The productive activity to be undertaken with funds from the loan also influences loan size (Table 9). The smallest loans, with a median size of $286, are for crops, mostly basic grains. The largest loans are for livestock. Their median size of $685 is median size of loans for crops. Loans for non-agricultural purposes, with a median size of $457, are in between. The largest loan observed was for non-agricultural purposes.

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[7] Rationing may simply reflect more acute information problems, not necessarily less repayment capacity.

For all three purposes, the mean size of the most recent loan exceeds the median size. This is particularly the case for non-agricultural loans. As a result, the mean size of loans for non-agricultural purposes is very similar to the mean size of loans for livestock. This is influenced by the very large non-agricultural loan observed and suggests that the median is a better indicator for a comparison of what is typical for each sector.

Thus, while the size of the most recent non-agricultural loans have a more skewed and dispersed distribution than loans for crops, livestock loans show a distribution that is not only bunched about the median but also is nearly symmetric since the mean is close to the median.

Several factors may cause these differences in the distributions. For example, it may be that loans for crops are smaller because Calpiá has lent for agriculture for just a few years. Calpiá may not yet know farm borrowers well enough to lend as much to them as it lends to its non-farm borrowers who have been customers for a longer time. It may be that agricultural loans are longer and so Calpiá learns less about the creditworthiness of a farmer in one year than it would for a trader who borrowed and repaid three times in one year. Or perhaps farmers demand smaller loans than do non-agricultural borrowers, given their cash flow requirements. Perhaps farmers have less repayment capacity or are subject to more volatile shocks. Livestock loans may be bigger, in turn, because the asset bought with the loan can serve as its own collateral. Furthermore, livestock may imply bigger lumps in which they must be bought and therefore require larger loans.

2.2.7.4 New versus repeat{tc \l4 "2.2.7.4 New versus repeat}

New borrowers, with median $571 and mean $1,080, get bigger loans than repeat borrowers, with median $457 and mean $770 (lines 7 and 8 of Table 9). In fact, the distribution of the amount disbursed for the most recent loan for new borrowers first-order stochastically dominates the distribution for repeat borrowers, at least at all the percentiles checked here.[8] This is a big surprise. It flies in the face of the thought that Calpiá uses repeated loans to learn whether it can risk an increase in the amount lent to a given borrower. How could Calpiá risk more money on new, untested, unknown borrowers than on tested, repeat, known borrowers?

At this point, the answer is unclear. But it is not impossible that new borrowers could get larger loans than repeat borrowers. Calpiá may have changed its methods or its policies. In the past, it may have been too scared to take a risk, but now it may feel more comfortable. Or it could be that Calpiá has sought out richer borrowers who have more and better guarantees and so can be trusted

[8] a necessary and sufficient condition for first-order stochastic dominance is that the c.d.f of one distribution be greater than the c.d.f of a second distribution at all points (Deaton, 1997). This is the case for new borrowers and repeat borrowers at all the percentiles listed. Active also is first-order dominant over inactive, and non-agriculture is first-order dominant over agriculture, with ties at the minimum.

with larger amounts right from the start. In any case, the reason for this odd result will no doubt tell a lot about how Calpiá works and about how it has changed with time.

2.2.7.5 Strata at the level of three combinations{tc \l4 "2.2.7.5 Strata at the level of three combinations}

The patterns found at the level of one stratum are also found at the level of combinations of strata (lines 9-17 of Table 9). The mean is always a lot higher than the median for each combination. The combinations that include inactive, crops, or repeat borrowers get smaller disbursements than the combinations with active, livestock, non-agriculture, and new borrowers. The combination with the smallest loans, most bunched distribution is inactive/crops. These inactive borrowers for crops represent one-third of the total and their behavior might have been influenced by *El Niño*. Corn growers earn among the lowest and most volatile incomes in the rural areas (Beneke de Sanfeliú and Shi, 1999). The combinations with the biggest loans, most dispersed distributions are active/non-agriculture/new and active/non-agriculture/repeat.[9]

2.2.8 Amount disbursed by number of loans in the lifetime{tc \l3 "2.2.8 Amount disbursed by number of loans in the lifetime}

The amount disbursed does not seem to increase with the number of loans received by a borrower from Calpiá (Table 12). This is a shock. Most of the reasons used to explain differences between distributions of amounts disbursed have so far been based on the premise that the MFO learns about the creditworthiness of a borrower with repeated loans and so can lend more without

[9] Note that sequence includes 13 cases of pairs of loans (26 loans) made to the same borrower on the same day. It also includes 77 cases (including the 13 cases of same-day loans) where the borrower had at least two overlapping loans (two consecutive loans where the second was disbursed before the due date of the first one), 24 cases of a string of 3 or more overlapped loans, and 6 cases of 4 or more, 3 cases of 5 or more, and 1 case of 6 overlapped loans. Note that the string of loans does not mean that all were outstanding at once at some point but rather that the borrower had at least one loan outstanding (and sometimes more than one) from the moment the first loan was disbursed until the moment the last one was paid.

a concurrent increase in risk. In fact, the sequence does not seem to affect the amount disbursed much.[10]

The amount disbursed at the minimum, the 10 percentile, and the 25 percentile do not change until a borrower has more than 10 loans, and then just a little bit. The median amount goes from $343 (¢3,000) to about $400 (¢3,500) once a borrower has 5-7 loans. This is not a big jump. As the sequence increases, the 75 and the 90 percentile do not change at all. The maximum disbursement appears to decrease as the sequence increases, but this likely is caused by just a few outliers and is not a general pattern.

Table 12: Distribution of most recent amount disbursed by sequence for the population

Sequence	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1	1,543	0.32	0.32	674	22,800	1,710	800	343	228	114	57
2	1,262	0.26	0.59	642	45,700	2,280	685	343	206	114	57
3	757	0.16	0.74	642	11,400	1,370	685	400	228	114	57
4	433	0.09	0.83	598	5,250	1,140	685	343	228	114	57
5	254	0.05	0.89	706	6,850	1,480	800	457	228	114	57
6	157	0.03	0.92	562	5,140	1,140	685	343	183	114	68
7	113	0.02	0.94	662	4,000	1,140	800	459	228	114	57
8- 10	155	0.03	0.98	630	3,080	1,600	800	400	228	114	57
11 or more	115	0.02	1.00	711	5,250	1,600	800	400	228	171	114
Population	4,789	1.00	1.00	651	45,700	1,370	685	342	238	114	57

Source: Authors' calculations with data from Calpiá.

Table 13: Distribution of most recent amount disbursed by sequence for all loans in the lifetimes of the borrowers in the super-sample

Sequence	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1	321	0.35	0.35	657	3,080	1,710	914	400	228	148	57
2	209	0.23	0.58	654	5,140	1,600	742	400	228	114	57
3	130	0.14	0.72	665	5,710	1,710	800	400	228	114	57
4	83	0.09	0.81	546	3,430	1,370	685	343	206	114	57
5	49	0.05	0.86	515	2,280	914	571	343	228	114	69
6	31	0.03	0.90	484	2,056	857	685	400	228	114	69
7	26	0.03	0.92	621	2,860	1,710	685	383	228	114	114
8- 10	45	0.05	0.97	651	2,860	1,370	800	457	288	171	69
11 or more	25	0.03	1.00	694	1,710	1,140	914	571	343	228	171

Source: Authors' calculations with data from Calpiá.

[10] This inference is based on information on *different* borrowers at various stages along the sequence. Additional research must determine the evolution of loan size for the *same* borrower.

This result begs for more research. There are at least five possible explanations. First, Calpiá might not base the increases in the amount of disbursements on past repayments. Second, Calpiá might peg the credit limit of new borrowers at their true repayment capacity right from the start. This could explain the result as long as the repayment capacity and the demand of the borrower do not change with time. Third, borrowers with more loans and thus higher sequences might also happen to get smaller loans. For example, traders often get frequent, small loans. If this were the case, then the distribution of amount disbursed by sequence for the portfolio as a whole might not change much with the sequence even though the amount disbursed increased with the sequence for each given borrower. This explanation is far-fetched, and more analysis below shows it to be false. Fourth, perhaps the bad weather in the past two years has led borrowers to ask for smaller loans even though Calpiá knows them well enough to make bigger loans. That is, loan size may be driven by a demand that has not grown. Fifth, Calpiá may not use knowledge of anything except the worth of the guarantee when it chooses how much to lend. If the worth of the guarantee does not change, then the size of the loan might not change.

Table 14: Distribution of most recent amount disbursed by sequence for all non-overlapped loans in the lifetimes of borrowers in the super-sample

Sequence	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1	296	0.40	0.40	691	5,140	1,710	874	457	228	171	57
2	185	0.25	0.66	661	5,710	1,710	800	400	228	114	57
3	101	0.14	0.79	684	3,770	1,710	914	457	228	114	57
4	62	0.08	0.88	552	3,770	1,142	685	343	228	114	57
5	32	0.04	0.92	516	2,860	914	571	343	228	114	57
6	18	0.02	0.95	810	3,080	2,400	1,140	457	228	68	57
7	12	0.02	0.96	819	2,860	2,060	1,140	485	257	114	114
8- 10	21	0.03	0.99	658	2,860	1,480	571	457	228	171	69
11 or more	7	0.01	1.00	490	800	800	685	571	171	171	171

Source: Authors' calculations with data from Calpiá.

This result is based on a list of all borrowers, the number of loans in their lifetimes, and the amount disbursed for their most recent loan. The same result holds with a different list supplied by Calpiá that has the amount disbursed for each loan in the lifetimes of the 321 borrowers drawn into the sample. There is no pattern of changes in loan size by sequence for the 321 borrowers. Of the borrowers with more than one loan, about 51 percent increased the amount disbursed and never decreased. About 25 percent decreased the amount disbursed and never increased. About 9 percent got the same size loan each time, and about 15 percent both increased and decreased the amount disbursed through their lifetimes. This erratic pattern would suggest that the distribution of loan size through the lifetime sequence results more from demand factors than from supply. One of the main goals of further research will be to explain this lack of a pattern.

2.2.9 Amount disbursed by sector{tc \l3 "2.2.9 Amount disbursed by sector}

One factor that affects credit demand is the sector of business. For example, traders might borrow to buy goods to sell, while farmers might borrow to buy inputs to produce a harvest which they then eat or sell. The quick turnover of commerce might lead traders to ask for smaller loans than farmers. It turns out, however, that Calpiá makes the biggest loans to rural households in industry, services, commerce, and livestock. The smallest loans go to crops (Table 15).

Table 15: Distribution of amount disbursed for the most recent loan by sector

Sector	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1. Crops	2,699	0.56	0.56	470	6,850	1,140	571	286	171	114	57
2. Livestock	985	0.21	0.77	888	5,140	1,710	1,140	685	342	228	57
3. Commerce	721	0.15	0.92	741	11,400	1,710	800	457	228	171	57
4. Services	199	0.04	0.96	1,120	45,700	2,060	913	571	285	171	57
5. Industry	185	0.04	1.00	1,180	9,140	2,860	1,140	571	343	228	114
Population	4,789	1.00	1.00	651	45,700	1,370	685	342	238	114	57

Source: Authors' calculations with data from Calpiá.

That industry would get big loans is no surprise. Households who make things often invest in fixed assets and machines. Loans can fund such large, lumpy purchases. That crops would get small loans may dishearten those groups who hope that Calpiá can serve as a model for a way to make loans to farmers for land or for other large assets such as tractors. But the result is not a surprise. Small farmers are in the poorest, most risky, and most distant sector. They use their small loans not to buy land or tractors but rather to pay for household expenses, wages, chemical inputs, and seeds. They farm not for export but to feed their family with corn and beans. Furthermore, rural borrowers in commerce are not petty traders as is often the case with urban merchants but rather the owners of fixed shops with standing inventory.

2.2.10 Amount disbursed by sector and by sequence{tc \l3 "2.2.10 Amount disbursed by sector and by sequence}

Crops is the only sector where the median amount disbursed seems to increase with the number of loans (Table 16). The increase is small and slow, and borrowers for crops start with the smallest loans of all five sectors. For livestock, the median does not change as the sequence increases. For commerce, the median decreases as the sequence increases. This is most likely an artifact due to the short terms of the smallest loans for trade. Loans in commerce with high sequences will also tend to be the smallest loans in commerce. This pulls the median down. For services and industry, the median stays the same or decreases a little in the first few loans. The data are too scanty to be of much use for the higher sequences.

Table 16: Median amount disbursed for the most recent loan for borrowers in the population by sector and by sequence

	Median amount disbursed by loan sequence								
Sector	1	2	3	4	5	6	7	8-10	11+
1. Crops	280	230	286	286	343	286	372	411	628

2. Livestock	914	571	571	571	571	571	600	571	459
3. Commerce	571	457	457	428	342	342	571	343	286
4. Services	571	543	571	571	457	343	1,710	343	571
5. Industry	571	571	457	685	571	685	571	343	514
Population	343	343	400	343	457	373	459	400	400

Source: Authors' calculations with data from Calpiá.

2.2.11 Amount disbursed by year{tc \l3 "2.2.11 Amount disbursed by year}

The amount disbursed to borrowers in the center of the distribution (90, 75, 50, 25, and 10 percentiles) increased slightly from 1995 to 1996 and from 1996 to 1997, the only years with enough disbursements to warrant analysis (Table 17). The increase could result from two factors. First, Calpiá could disburse larger loans to borrowers of a constant known creditworthiness (less conservative). Second, the portfolio in later years might contain more repeat borrowers. Calpiá may know these borrowers better and thus be willing to lend them more. Third, Calpiá may have changed the way it screens borrowers, or it may have learned how to use better the data from an unchanged way to screen. This would increase Calpiá's knowledge of creditworthiness and thus let them lend more without an increase in risk. Fourth, the amount disbursed may have grown in nominal *colones* but not in constant *colones* per dollar. It seems unlikely, however, that this adjustment would affect the basic results. Inflation was in single-digits, and the exchange rate did not change much at all.

Table 17: Distribution of amount disbursed for the most recent loan by year of disbursement of the first loans for borrowers in the population

Year	Freq.	p.d.f.	c.d.f.	Mean	Max	90	75	50	25	10	Min
1992	3	0.00	0.00	1,600	3,430	3,430	3,430	800	571	571	571
1993	12	0.00	0.00	610	2,280	1,140	970	343	143	114	57
1994	332	0.07	0.07	721	5,250	1,710	914	459	228	114	57
1995	1,313	0.27	0.35	535	11,400	1,140	571	343	171	114	57
1996	1,366	0.29	0.63	644	10,300	1,370	800	343	171	114	57
1997	1,763	0.37	1.00	728	45,700	1,710	800	400	228	171	57
Population	4,789	1.00	1.00	651	45,700	1,370	685	342	238	114	57

Source: Authors' calculations with data from Calpiá.

To control for changes in the knowledge of the creditworthiness of repeat borrowers, Table 18 lists key percentiles for the distribution of the amount disbursed just for new borrowers. This helps to check whether Calpiá changed how it screened borrowers through time or whether Calpiá changed how it used the knowledge gained from an unchanged way to screen.

Table 18: Distribution of amount disbursed to new borrowers by year for borrowers in the population

Year	Freq.	Mean	Max	90	75	50	25	10	Min

1995	261	427	2,280	1,140	571	251	171	114	57
1996	290	678	10,300	1,710	742	343	171	114	57
1997	977	740	22,800	1,710	914	459	228	171	57

Source: Authors' calculations with data from Calpiá.

Table 19: Distribution of amount disbursed to new borrowers by year for borrowers in the super-sample

Year	Freq.	Mean	Max	90	75	50	25	10	Min
1994	27	779	3,080	2,280	1,370	400	228	114	114
1995	70	557	3,080	1,541	685	343	171	74	57
1996	78	588	3,430	1,140	685	371	228	114	57
1997	143	712	2,860	1,710	1,140	457	228	171	57

Source: Authors' calculations with data from Calpiá.

It seems that Calpiá has indeed increased the amount disbursed to new rural borrowers through time. The 1997 distribution first-order stochastically dominates the 1996 distribution, and the 1996 distribution first-order stochastically dominates the 1995 distribution. For example, as shown in Table 18, the median in 1997 ($459 or ¢4,000) is almost twice as much as the median in 1995 ($251 or ¢2,200). More work is needed to confirm whether this phenomenon is due to changes in Calpiá, or changes in the demand of new borrowers.

2.3 Regression analysis of the amount disbursed{tc \l2 "2.3 Regression analysis of the amount disbursed}

The analysis of the amount disbursed so far has been descriptive and non-parametric. The analysis has been unconstrained with respect to the link between the amount disbursed and other variables. This is nice, but without a lot more data, descriptive and non-parametric statistics cannot control for the effects on the amount disbursed of more than one or two other variables. For example, Table 16 controls for the effects of sequence and sector of activity on the amount disbursed, but about half the cells cannot be used since they have too few data points.

Regression analysis controls for more variables at the cost of introducing constraints on the functional relationship between them. The analysis here uses ordinary least squares (OLS) to estimate not the median but the mean of the amount disbursed of the most recent loan, conditional on the sequence, the year disbursed, and the sector.

The dependent variable is the amount disbursed in dollars for the most recent loan. The independent variables are three sets of dummy variables, one for the loan sequence, one for the year of disbursement, and one for the sector of business of the borrower.

The OLS results are shown in Table 20. The regression explains about 8 percent of the variation in the amount disbursed (R^2=0.08). The estimated coefficients are the change, relative to the base case, in the mean of the amount disbursed caused by a switch in the dummy variable from zero to unity. The base case is a loan of sequence 11 or more, disbursed in 1997, to a livestock borrower. Conditional on these values of the three groups of variables, the estimated mean is the estimate of the intercept, $899. This conditional mean changes when one of the three variables that condition it change. For example, a loan disbursed in 1997 to a borrower in sequence 11 or more in the sector of commerce would be the base case ($899) plus the estimated coefficient for the commerce sector (-$187), or $899-$187=$712. a loan disbursed in 1996 to a borrower in the eighth sequence in the commerce sector would have an expected amount of the base case ($899) less the shift due to the change in sequence (-$47) less the shift due to the change in year disbursed from 1997 to 1996 (-$17) less the shift due to the change in the sector from livestock to commerce (-$187), or $899-$47-$17-$187=$648.

Table 20: Estimated coefficients and probability of being zero for regression of amount disbursed on sequence, year disbursed, and sector

Variable	Value	Estimate	p value
Intercept		899	0.00
Sequence	1	38	0.62
	2	-15	0.85
	3	5	0.95
	4	-7	0.93
	5	52	0.53
	6	-66	0.46
	7	3	0.97
	8-10	-48	0.59
	11 or more	base	n.a.
Year disbursed	1992	676	0.10
	1993	14	0.95
	1994	145	0.01
	1995	-86	0.01
	1996	-17	0.54
	1997	base	n.a.
Sector	Crops	-418	0.00
	Commerce	-187	0.00
	Industry	286	0.00
	Services	-113	0.04
	Livestock	base	n.a.

Source: Authors' calculations.
Five loans of more than $10,000 were excluded.

Table 21:

Variable	Value	Estimate	p value
Intercept		351	0.55
Same-day loan	Yes	64	0.52
Overlap sequence	1	-10	0.98
	2	88	0.87
	3	89	0.87
	4	124	0.83
	5	-345	0.6
	6	base	n.a.
Sequence	2	-50	0.7
	3	-78	0.55
	4	-125	0.34
	5	-74	0.59
	6	124	0.4
	7	-169	0.28
	8-10	94	0.49
	11 or more	base	n.a.
Year disbursed	1994	-600	0.00
	1995	-497	0.00
	1996	-405	0.00
	1997	-304	0.00
	1997	base	n.a.
Month disbursed	Jan.	-65	0.74
	Feb.	-200	0.14
	March	-214	0.07
	April	-143	0.21
	May	-89	0.42
	June	-208	0.07
	July	-146	0.22
	Aug.	-40	0.73
	Sept.	-196	0.08
	Oct.	-66	0.55
	Nov.	-10	0.93
	Dec.	base	n.a.
Sector	Agriculture	31	0.83
	Livestock	-25	0.87
	Commerce	-63	0.72
	Industry	-307	0.28
	Services	base	n.a.

Source: Authors' calculations.
Five loans of more than $10,000 were excluded.

The *p value* in Table 20 is the probability (hence *p*) that the estimated coefficient could be zero and that the non-zero estimate is just the result of random sampling error (McCloskey and Ziliak, 1996). Lower p values mean more certainty that the estimate is not zero. For example, all the p values for the coefficients linked to sequence are greater than 0.45. The estimates are not non-zero with much certainty. In contrast, all the p values for the estimates for the sector dummies are less than 0.05. There is more than a 95 percent probability that these coefficients are not zero. Still, tests not reported here suggest that the whole group of dummy variables that stand for the sequence are not likely to be zero as a group. This is true even though all or some of the individual estimates are not likely to be non-zero. The same holds for the groups that stand for the year disbursed and for the sector.

None of the sequence dummies are statistically different from zero. This supports the idea that the amount disbursed does not change much as a borrower progresses in the loan sequence. The descriptive work found the same result.

The dummies for loans disbursed in 1994 and 1995 are both statistically different from zero. The estimate for 1994 is $145. This says that the mean for loans disbursed in 1994 is $145 more than the mean for the base year of 1997. The -$87 estimate for 1995 means that the average loan in 1995 was less than in the base year. Sequence and sector held constant, the average amount disbursed grew from 1995 to 1997. This matches the descriptive result when just sequence was held constant.

All the coefficients on the sector dummies are large and statistically different from zero. The estimate for industry is $286. This means that the mean conditional on the industry sector is greater than the mean conditional on the livestock sector. The estimates for crops, commerce, and services are all negative since their conditional means are less than that of the livestock sector. Crops, with the most negative estimate, has the lowest conditional mean. All of this matches the descriptive results that did not control for both sequence and year of disbursement.

As a whole, the parametric analysis with OLS does not suggest results different from those of the non-parametric analysis with cross-tabulated medians and other percentiles of the distribution of the amount disbursed. This is due in large part to the fact that sequence has little effect on the amount disbursed. Thus, the parametric analysis did not gain much when it controlled for sequence as well as for year disbursed and for sector.

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