

Les déterminants de l'épargne et des choix d'investissement des ménages au Nicaragua*

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Résumé: Les études empiriques sur le comportement d'épargne des ménages à bas revenus dans les pays en voies de développement peuvent être divisées en deux catégories. La première analyse les déterminants du taux d'épargne des ménages. La deuxième catégorie recherche les déterminants des choix de portefeuille des ménages, entre des actifs productifs utilisés dans le processus de production du ménage et les actifs non productifs (argent liquide, bijoux, stocks de céréales, etc.). Dans ce papier, nous analysons simultanément les déterminants des taux d'épargne des ménages et des choix entre épargner de l'argent à la banque ou l'investir dans du capital productif. Nos résultats empiriques indiquent que les ménages pauvres n'épargnent pas dans les institutions financières, mais qu'ils investissent toute leur épargne dans leur unité de production. En effet, les rendements sur les investissements sont plus élevés que les taux d'intérêt sur l'épargne monétaire. Seulement une fois que le ménage a accumulé suffisamment de capital physique, de telle sorte que le rendement marginal est pratiquement nul, il commence à déposer l'épargne à la banque. Nos résultats semblent se confirmer tant pour les ménages urbains que ruraux, et tant pour les ménages qui vivent de la production agricole que pour ceux qui ont d'autres sources de revenu.

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1 Introduction

The literature on household saving in developing countries can be grouped into two types of approaches (see Dauner, 2004a). The first group analyzes the motives and determinants of households' levels of saving, i.e. saving as defined by the difference between current income and consumption. The second group focuses on the composition of household saving, in particular the allocation of wealth between productive and non productive assets. The objectives of the present paper is to look simultaneously at both aspects of household saving behaviour, in particular, to analyze whether the determinants of saving rates also affect the investment choices of households between different types of assets.

The result of the first group of studies - on motives and determinants of saving - agree upon the fact that the permanent income hypothesis (PIH) and the life-cycle hypothesis (LCH) are not appropriate to analyze household saving in developing countries. Actually, most of these households are far from their equilibrium level of wealth and subject to very uncertain income flows in the absence of formal insurance systems. Moreover, the hypothesis of perfect capital markets and the absence of risk aversion, underlying the PIH and LCH, are too restrictive. All studies agree that the precautionary motive for saving is central to analyze the saving behaviour of low income households, who are risk averse and have very little reserves to protect themselves against negative shocks on income or consumption. Finally, poor households in developing countries are subject to liquidity constraints.

The second group of studies - on asset allocation of farm households - agrees upon the facts that the composition of households' portfolios depend on the initial level of productive capital, on the degree of risk aversion and on income variability. Nevertheless these studies disagree on certain results, as for example the existence of a poverty trap. According to the poverty trap hypothesis, poor households with low levels of capital, high risk aversion and liquidity constraints, invest in low risk portfolios. These portfolios have low returns which prevent households to invest in high return, though risky productive assets.¹ Nevertheless, the studies which provide support for the existence of a poverty trap assume that investments in productive assets are indivisible and/or irreversible, or that households have a subsistence level of consumption, which prevents them from taking too many risks.

In our data even the poorest households own productive assets (livestock, land, etc.). In the empirical estimations, we show that the poor have proportionally more productive assets in their portfolio than the rich. Additionally, we provide evidence that income, wealth, education and access to credit have positive effects on the holding of monetary savings in a financial institution. We also show that, all else being equal, household saving rates in Nicaragua increase

¹Productive assets are defined as the assets used in the production unit (for example land, livestock, tools, etc.); they have risky and relatively high returns. Non productive assets are the ones which do not contribute to increase production. Generally, they are represented by cash kept at home, jewelry, grain stocks, etc. We will consider monetary savings in a bank as a non productive asset. These assets have low though secure returns.

with income and decrease with the level of wealth and the level of education. People who live in urban centres save relatively less than those who live in rural areas.

The empirical estimations of the saving and investment equations are limited to the scope of available variables. In order to analyze the asset allocation problem of low income households, we need data on investments in productive and non productive assets, respectively. The data is provided by two different household surveys performed in Nicaragua in 1998. The first data set comes from a national survey of more than 4000 households done by the Nicaraguan Statistic Institute, using the methodology of the World Bank's Living Standard Measurement Surveys (LSMS). The second survey contains 300 observations and has been performed by the author in three rural regions of Nicaragua. The LSMS survey will be used to estimate the determinants of holding non productive assets, reflected by the ownership of a savings account in a financial institution. The author's survey contains data on the net purchase of productive assets, and will thus allow to analyze the determinants of investing in productive assets.

We will divide the data between two types of sub-samples, landowning versus landless households, and rural versus urban households, to try and identify possible differences in saving behaviour among different groups of people. Actually, we have seen in Dauner (2004), section 4, that the studies on households' asset allocation all concentrate on farm households. We are thus interested to identify whether non farm households show similar behaviours in the saving and asset allocation than farm households.

The present paper is divided in five sections. After the introduction, we present the theoretical framework in section 2, based on the results of previous household saving and portfolio allocation studies. The remaining part of section 2 provides the reader with the empirical model to be estimated in this paper and the variables used in the regressions. Section 3 contains the data needed to estimate the model, with a particular emphasis on the income and wealth variables, which are two important explanatory variables for households' saving rates. In particular, we will analyze which are the variables that explain income differences among households and how different types of households allocate their productive assets. Section 4 contains the empirical results of the econometric model and is divided into four subsections, first showing the determinants of saving rates, second the determinants of holding a saving account, third the determinants of investing in productive assets, and finally, the relationship between the interest rate on loans and household wealth. This last subsection will be an important contribution to support the results of the theoretical model in Dauner (2004b). Section 5 concludes.

2 Theoretical framework

In this section we summarize the hypothesis and results of previous studies, with respect to the determinants of household saving rates and of the asset allocation between productive and non productive assets. The variables used in the empirical estimations will then be presented, before setting up the econometric model and presenting the empirical equations.

2.1 Hypothesis and results from the literature

With the two data sets (1998 LSMS and author's survey), we are able to analyze respectively the determinants of household saving rates, the determinants of owning a savings account in a financial institution (as a proxy for non productive assets) and the determinants of investing in productive assets.

We will also analyze the causality link between a household's level of productive assets and the interest rate paid on loans, given that in Dauner (2004b), we modelize the use of credit to invest more rapidly in productive assets.

Moreover, we want to analyze whether those variables which influence saving rates also have an effect on asset choices. Thus, the explanatory variables will be the same for all three equations, respectively the one explaining saving rates, the probability to have a savings account and the investment in productive assets. We are more interested in the signs of the coefficients than their size. Table 1 below shows a summary of the hypothesis of our empirical model. Nevertheless, the literature does not provide results and hypothesis for all variables; the ones which remain open will be quoted by a question mark in table 1.

2.1.1 Determinants of saving rates

While empirical studies seem to agree that, all else being equal, saving rates increase with **income**², the effect of **wealth** on saving rates is not clear. The household surveys used here provide no information on the volume of monetary savings. We will thus use the level of productive assets (including housing and durables) as a proxy for total wealth. Some research on asset allocation by farm households suggests that poor households have a target stock level of livestock (productive assets), after which they start accumulating non productive assets.³ The proxy for wealth may thus have a negative effect on the saving rate.

Whether households who have **access to a financial institution** have a higher saving rate than those who cannot save in a financial institution, depends on the alternative savings and investment options. Those households who can invest in their production unit might not be affected by the presence or absence of alternatives, contrarily to households who only live on a paid salary.

The studies on household portfolio allocation suggest that productive assets may be indivisible and irreversible. In other words, the investment in productive

² See section B.3. in the annexe of chapter I.

³ See results by Rosenzweig and Wolpin (2000), Aryeetey and Udry (2000), Fafchamps et.al. (1998) presented in chapter I.

assets induce **transaction costs**, which may have an influence on investment choices. Nevertheless, transaction costs should not have an effect on saving rates.

Demographic variables that influence households' tastes and which are commonly used in empirical models on household saving are age, household composition, education, occupation, location. According to the LCH, the relation between **age** and saving is considered to be quadratic, i.e. households dissave at young age, save at middle age and dissave again after retirement. Nevertheless, various empirical tests of the LCH have shown that households do not dissave after retirement (see Dauner, 2004a). We will test the hypothesis of a positive linear relation between the age of household head and the saving rate.

Household composition is defined by being either single or married, with or without children. According to empirical studies, saving rates are highest for married couples without children, lower for couples with children and lowest for single parents. Moreover, the bigger the household, the lower is the saving rate.

Education usually has a positive effect on household saving rates, through the hypothesis that it influences permanent income, which has a positive effect on saving.

Occupation is used to test for the precautionary saving motive, with the hypothesis that households who live on a secure job, like salaried workers, need less to save for precautionary motives, than households who live on a risky job, like self-employed. Nevertheless, some authors argue that occupation is not a good proxy for risk aversion, because of self-selection, i.e. agents who are risk averse choose safe jobs. Hence, the effect of occupation on saving is ambiguous. Moreover, in Nicaragua, working as salaried employee is not a guaranty for stability, given that employment is scarce and unemployment insurance inexistent. Therefore, we will not estimate the direct effect of occupational choices on household saving rates. Instead, we will analyze the effect of different occupations on household income in section 3.1.

Finally, **location** might reflect differences in tastes, in access to savings services, in income variability (rainfall), which may have an influence on the saving rate.

2.1.2 Determinants of saving in a financial institution

Given that the data does not provide information on monetary saving levels of households, we use the ownership of a savings account to proxy non productive asset holdings. To our knowledge, no previous research has been done to analyze the determinants of owning a savings account.⁴ Nevertheless, research on portfolio allocation by poor households in developing countries suggests that these households invest a high proportion of their portfolio in non productive assets. Thus if we consider monetary savings to be a good proxy for non productive asset holdings, **wealth** should have a negative effect on the probability

⁴Except Dauner (2002a).

to hold a saving account. Other studies, nevertheless, suggest that only those households who have reached a certain level of productive assets start investing in non productive (financial) assets.

All else being equal, we assume that households save more if they have a positive **income** shock than if they have a negative shock. Nevertheless, we cannot say much on whether they save more in productive or non productive assets.

Intuitively, households who have better **access** to a financial institution should be more propense to own a savings account. Therefore, we will assume that households who live far away from a financial institution (measured by the distance to the closest bank) have less probability to save in monetary form.

A higher **transaction cost** on productive assets may induce households to save more in non productive assets. We thus expect that households who face higher transaction costs have more probability to own a saving account. Nevertheless, the analysis of the transaction cost is limited by the absence of a good proxy. We will use the ownership of a land title as a proxy for transaction costs, which implies that only landowning households are concerned by this variable.

With respect to the demographic variables, a study by Dauner (2002a) shows that the **age** of the head of household has a negative effect on the propensity to save in a financial institution, given that older people of Nicaragua still remember their bad experiences with monetary savings during the periods of hyperinflation in the 80's.

Household composition, proxied by the sex of the household head, should not have any effect on the probability to have a saving account. Nevertheless, female-headed households (usually single mothers) have lower income and saving rates, and are thus less likely to own a savings account. Finally, in Dauner (2002a), **education** and living in urban areas (**location**) have positive effects on the ownership of a savings account.

2.1.3 Determinants of investments in productive assets

If we assume that households have a target level of productive assets⁵, investments in productive assets should decrease with **wealth**. Nevertheless, if we assume that low income households do not invest much in productive assets, because of the indivisibility and irreversibility of these investments, wealth may have a positive effect on that variable. Similarly as with wealth, we do not know the effect of **income** on the investment choices of households.

The availability of **family labour** for the production unit would be an interesting variable to analyze investment in productive assets. Unfortunately, the huge variety of income generating activities makes it almost impossible to calculate and compare the use of family labour in the household. However, we will briefly discuss that variable when analyzing the results of the equation on productive investments in section 4.3.

⁵See footnote 3.

Comparing two equal households (in terms of preferences, production and wealth), one of which has **access** to a financial institution and the other one has not, we may assume that the former will invest less in productive assets than the latter. Actually, access to monetary savings may give a further possibility to buffer consumption against negative income shocks.

Higher **transaction costs** on productive assets may induce households to use less the productive and more the non productive assets to buffer consumption. Nevertheless, as mentioned above, the transaction cost is badly proxied, by the holding of a land title.

For the **demographic variables** we have no hypothesis as to their effect on the holding of productive assets.

2.1.4 Interest rate on loans

In the theoretical model of Dauner (2004b) we will analyze the effect of access to credit on households' investment strategies. Hence, in the present paper we will estimate whether poor households (in terms of wealth) pay higher interest rates on loans than rich households.

2.2 Choice of variables for the empirical estimation

In order to verify the hypothesis set in section 2.1, an econometric model has to be derived, using variables for which data is available. Four equations explaining the *dependent variables* are estimated: (1) the saving rate, (2) saving in an institution, (3) investment in productive assets and (4) interest rate on loans. All variables are observed at the household level.⁶

(1) The variable **saving rate** has been calculated as income minus consumption over income, $(Y - C)/Y$. The consumption level, C , is directly provided by the LSMS data set⁷, while income, Y , had to be computed by totalizing the incomes of each household member.

(2) **Saving in an institution** cannot be observed, because households have not been asked about their total volume of monetary savings. We will use the binary variable "having a saving account" as a proxy.

(3) **Productive investment**, in relative terms, (I/Y) is not observed in the LSMS (1998), only the level of capital. But in our data set (household survey 1998), we have asked households how much they had bought and sold in the previous year, and how much money they had borrowed. This allowed us to compute net investment of each household. We will use that data set to estimate equation (3).

(4) **Interest rate on loans** (r) has been calculated as the monthly interest rate paid on the biggest outstanding loan of the household.

⁶In the LSMS (1998) survey a household is defined as a person or group of persons, relatives or not, who usually live in the same house and share their food.

⁷This variable is the sum of the consumption of food (including autoconsumption and presents), housing (payment of services and rent), education, health, equipments (cost of use), transport and other expenses (personel hygiene, repairs, maintenance, ceremonies, etc.).

The *explanatory variables* of the model, mentioned in section 2.1, are: income, capital (wealth), access to saving services, transaction cost and demographic variables.

Income (Y) reflects the sum of all net income flows from all household members, including in kind donations and autoconsumption, during the last 12 months before the survey.⁸

Capital (K) is the sum of capital goods owned by households. It includes the value of their house, land, livestock, business inventory, agricultural equipment and durables. We consider durable goods as being part of household's capital (or wealth). The service of these goods is included in the consumption variable but not their purchase.

Banks and savings and credit cooperatives are located in towns which have a market. Hence, **Access to saving services** (*distance*) is proxied by the time (in minutes) that people need to go to the place where they purchase their food. We excluded the few cases of households who were doing all their shopping in the neighbouring shop or from door to door sellers.

In order to proxy the **transaction cost** on productive assets, we assume that those landowning households who have a legal title for their land face a lower transaction cost than those who have no land title. It is easier to sell land that is legally registered, because the new owner has no risk to be the victim of land claims from former owners.⁹ Hence, this variable will only be relevant for landowning households who have sold land, and will be proxied by the presence or absence of a *land title*. Transaction costs are lower for households who have a land title. It is also said that farmers who have a land title invest more on their land, given that they have a higher security on its ownership.¹⁰

As mentioned earlier, the econometric estimation will include a series of **demographic variables**:

Age is given by the age of the person who has been declared head of household.

Household composition will be determined by three variables in the econometric model. First, we take the number of members (*household size*), which is supposed to have a negative impact on saving rates. Second, the *dependency ratio* gives a measure of the number of dependent household members (aged under 15 or over 65) over the number of potentially active members (aged between 15 and 65). This ratio should have a negative effect on household saving rates. The third variable used to reflect the composition of household is the sex of the head of household. The data shows that if the head of household is a woman (*female head of household*), she is a single mother.

⁸Unfortunately, the variable does not include remittances.

⁹Many big land (*hacienda*) owners who lost land during the agrarian reform in the 80's, in favour of previously landless households, left the country during the civil war. They came back in the 90ies and some of them claimed back their former land. Not all small farmers who benefited from the agrarian reform have land titles. Hence, they might be victim sometime of a land claim from a former *hacienda* owner. For more details about that topic, see Deininger and Chamorro (2002).

¹⁰Deininger and Chamorro (2002).

Education is measured as the number of years of schooling of the most educated member of the household.

Occupation will not be an explanatory variable in the empirical estimation, because of the problems of self-selection mentioned at the end of section 2.1. Nevertheless, the database provides an indicator of income shocks for farming households. Hence, the variable *drought/disease*, reflecting whether households have been negatively affected by a drought and/or a disease (on crops) in the last agricultural season, will be used to test for the **precautionary saving** motive, according to which higher income risk induces people to save more.

Location is reflected by the fact that the household lives in an urban or a rural area.¹¹

We have added two variables, which might have some effects on households' saving behaviour:

Credit reflects the fact that the household has received one or more credits during the last 12 months.¹² We assume that credit fosters investment and hence, that households with credit have a higher mean level of investment than those without credit. We also assume that the wish to obtain a credit positively influences the opening of a savings account. The overall effect on saving rates should thus be positive.

Insecurity equals 1 for a household who has been robbed in the last 12 months before the survey. We assume that households who face higher insecurity due to theft are more propense to open a saving account.

2.3 Econometric model

The first equation explains the saving rate,

$$\frac{Y - C}{Y} = a_1 + b_1 X_1 + u_1 \quad (1)$$

where b_1 is the vector of coefficients to be estimated and X_1 the matrix with the data for the explanatory variables. The variables in X_1 are shown in the first column of table 1, with their expected effects on the dependent variable.

The second equation explains the probability of a household to have monetary savings in a financial institution:

$$P(\textit{saving account}) = a_2 + b_2 X_2 + u_2 \quad (2)$$

¹¹In the 1998 LSMS, the urban area is characterized by a more or less ordered and grouped distribution of buildings, with paved roads, places, parcs, etc. and a basic infrastructure of sanitary, water distribution network, electricity, etc.

The rural area is characterized by a dispersed distribution of buildings and the absence of basic infrastructure. Villages of less than 1000 inhabitants are always included in that category.

¹²The effect of a credit constraint on households' saving behaviour has been analyzed in different theoretical and empirical studies (for a brief overview, see section 3.2 in chapter I). In the present case, the variable credit does not reflect the existence or absence of a credit constraint. Households who do not have credit are not always credit constrained.

Equation (3) explains the relative productive investment,

$$\frac{I}{Y} = a_3 + b_3 X_3 + u_3 \quad (3)$$

Note in table 1 that equation (3) is not as well specified as equations (1) and (2) with respect to demographic variables. Empirical models on household saving that use demographic variables to explain saving behaviour do not analyze the effects of these variables on the holding of productive assets. Hence, the expected results remain open for most of the explanatory variables in equation (3).

Finally, Equation (4) models the effect of changes in capital ($\log K$) on the interest rate ($\log r$) that households are willing to pay on a loan:

$$\log r = a_4 - b_4 \log K \quad (4)$$

where a_4 and b_4 are the parameters to be estimated in section 4.4.

Table 1:	Econometric model, equations (1) to (3)		
	Equation (1)	Equation (2)	Equation (3)
dependent variable:	$\frac{Y-C}{Y}$	<i>saving account</i>	$\frac{I}{Y}$
explanatory variables:			
<i>log capital</i>	-	?	?
<i>log income</i>	+	?	?
<i>distance</i>		-	
<i>saving account</i>	?		-
<i>land title</i>	0	?	0/+
<i>dependency ratio</i>	-	?	?
<i>household size</i>	-	?	?
<i>female head of HH</i>	-	-	?
<i>education</i>	+	+	?
<i>age</i>	+	-	?
<i>credit</i>	+	+	+
<i>drought/disease</i>	+	?	?
<i>insecurity</i>		+	
<i>urban area</i>	?	+	
Data base	LSMS	LSMS	author's

3 Description of data

The data collected in the LSMS, performed in Nicaragua in 1998, is representative at national, urban, rural and regional levels. We present the data that will be used in our econometric estimations, in particular those variables used to explain the saving and investment behaviour of the population. As already mentioned, we will estimate the model on the whole sample, but also on sub-samples

of urban versus rural population and landowning versus landless households. In section 3.1 we present the overall data. In section 3.2 we take a particular look at the income variable and explain it by different household characteristics, in particular with respect to occupation. We compare the regression of income on different explanatory variables with the regression of consumption on the same variables, to compare the quality of these two measures. Finally, in section 3.3, the asset portfolios of households are presented for the different sub-samples.

3.1 Overall presentation of data

From the 4081 observations in the data set, a total of 3586 could be retained for the present analysis, according to the availability and coherence of information on the variables used in the econometric model. We have also excluded 23 observations for which the saving rate was abnormally low (< -100).

In table 2 the mean and standard deviations of the continuous variables and the percentage of the dichotomous variables are presented. For the sub-samples on **location**, we observe that 55% of households in Nicaragua live in urban areas, and 45% in rural areas¹³. Among all households, 35.1% own or rent land¹⁴ and most households who own land live in rural areas, although some (17.9%) live in urban areas.

The **saving rate** has been calculated as net income minus consumption divided by net income. The average saving rate is negative for the whole sample, as well as for the different sub-samples. This negative value is often mentioned as a problem in empirical research on household saving in developing countries: income is usually underestimated relative to consumption (Deaton, 1997). In our particular case, income is understated because households in the LSMS survey were not asked about income from remittances.¹⁵ We should keep this in mind when analyzing the results.

The extremely low saving rates might explain why only 5.1% of households own a **saving account** in a financial institution. The country went through difficult times during the decade of the 1980's because of the civil war, accompanied by periods of hyperinflation and devaluations. People who previously saved in the banks lost all their savings. Relative monetary stability has been observed since the beginning of the 1990's and private banks have opened branches all over the country. Confidence in the financial sector has not come back completely yet.¹⁶ Nevertheless, according to statistics from the banking supervisory authorities in Nicaragua, in 2000, 15% of the population in the capital city, Managua, had a banking account, against 4% of the population outside of

¹³See footnote 5 for a definition of urban and rural areas.

¹⁴We have included those households who hire land in the subsample of land owners, because their weight is very small and we assume that their behaviour is similar to that of small farms, in terms of investment and saving.

¹⁵In the author's 1998 database, 17% of households have received remittances from family members, mostly from Costa Rica, the United States and Guatemala. Nevertheless, people are reluctant to give that information, because migrants move clandestinely. Hence, the real proportion is probably much higher than 17%.

¹⁶See Daumer (1998).

Managua (Dauner, 2002b). These differences with the LSMS (1998) reflect that some surveyed households may not have responded to the question on saving accounts and/or that some household have more than one saving account.

The variable on **credit** indicates that 10.5% of households have had one or more credits from an institution during the last 12 months before the survey was performed. We have excluded from this statistic the loans that households have received from relatives and friends. The proportion of households with credit is higher for urban households and for landless households. More on that variable, in particular where the population gets credit from will be presented in section 4.4.

Table 2: Descriptive statistics: mean, (standard deviation), %

	total sample	rural	urban	land owner	land less
saving rate ($\frac{Y-C}{Y}$)	-2.70 (7.12)	-3.39 (7.80)	-2.13 (6.47)	-4.37 (9.08)	-1.78 (5.59)
saving account	5.1%	1.3%	8.3%	1.7%	7.0%
land title	11.5%	20.4%	4.2%	32.6%	0.0%
log capital	9.52 (1.88)	9.21 (2.02)	9.77 (1.71)	9.85 (1.86)	9.34 (1.86)
log income	9.44 (1.22)	9.01 (1.20)	9.79 (1.11)	8.89 (1.29)	9.73 (1.06)
log consumption	10.09 (0.72)	9.79 (0.63)	10.33 (0.69)	9.86 (0.67)	10.22 (0.71)
dependency ratio	1.28 (1.24)	1.16 (1.17)	1.38 (1.29)	1.21 (1.24)	1.32 (1.24)
household size	5.730 (2.80)	6.09 (2.93)	5.43 (2.64)	6.38 (2.93)	5.37 (2.66)
distance	42.61 (92.64)	70.70 (129.86)	20.05 (28.09)	72.76 (138.67)	26.22 (45.80)
female head of HH education	24.8% 8.31 (4.78)	15.4% 5.93 (3.89)	32.4% 10.25 (4.56)	10.4% 6.03 (4.03)	32.6% 9.56 (4.70)
age	44.86 (15.30)	44.33 (15.87)	45.25 (14.81)	46.19 (15.81)	44.17 (14.97)
credit (institutional)	10.5%	6.8%	13.6%	7.4%	12.2%
urban area	55%			17.9%	75.2%
drought/disease insecurity	32.1% 3.2%	59% 6.6%	10.1% 1.3%	90.8% 10.2%	0.3% 0.0%
land owners	35.1%	64.2%	11.4%		

Source: Nicaragua LSMS, 1998

Only about 1/3 of households who own land have a registered **land title**. Others have titles that are in the process of being registered, or a contract showing that they have bought the land; some have no title at all.

The **dependency ratio** is bigger than unity, reflecting the high proportion of children in relation to adults. This ratio is smaller in rural areas, contrarily

to what could have been expected. Actually, households are bigger and have more children in rural areas, but the number of dependent members over 65 might be smaller in rural than in urban areas, due to shorter life expectancy.

The mean value for years of **education** might seem extremely high to the reader, contrarily to other sources of information. Actually, the variable refers to the household member with the highest level of education. Children in Nicaragua start school at the age of 4 and enter university between the age of 16 and 18. Hence, if they have a bachelor's degree, they have gone to school 12 to 14 years.

Finally, one striking data in table 2 is the high level of **drought/disease** for landowning households. More than 90% of them have suffered a negative shock on their production in the 1997/1998 agricultural season.¹⁷ Hence, we have to keep in mind throughout the paper that agricultural income have been relatively low in the survey year.

3.2 Determinants of household income

We will see in the results of the econometric model that income has a strong positive effect on households' saving rates. Hence, we need to explain better what stands behind that variable. In the 1998 LSMS for Nicaragua, average net annual income per household was C\$ 24'171.4 (US\$ 2284.6)¹⁸, with a standard deviation of 36'122. The mean per capita annual net income was C\$ 4983 (US\$ 471 US\$). 15.4% of households are below the extreme poverty line, 44.4% live under the overall poverty line.¹⁹ Poverty is more stringent in rural areas where these numbers are respectively 25.9% and 64.5%, against 6.8% and 27.9% in urban areas.

According to the data, 48.4% of the population aged between 15 and 65 years were economically active at the moment of the survey: 14.5% were working on their farm, 10.3% in their non-farm family business and 23.6% were employed on the labour market. The other 51.6% were either going to school or university (15%), or working in different domestic activities that do not directly yield income.

Among those who work in the **labour market**, 36.7% work in the primary sector (agriculture, cattle breeding, wood extraction, fishing, etc.), 9.1% work in the secondary sector (food processing, textile, handicraft, chemical industry, machinery, etc.) and 54.2% in the tertiary sector (provision of basic services, trade, tourism, transport, real estate, etc.).

¹⁷Even though the survey was performed a few months before Hurricane Mitch, which literally devastated some regions of the country.

¹⁸The local currency is the Córdoba (C\$) whose mean exchange rate in 1998 was C\$10.58 for US\$1.

¹⁹As defined by the World Bank, the overall poverty line is the level of per capita monthly (food and non-food) expenditures at which an individual obtains the minimum daily caloric requirement.

The extreme poverty line is the level of per capita monthly **food** expenditure required to obtain the daily minimum caloric requirement.

Employed labour is scarce in Nicaragua. Many households run a small family business in the informal sector or live from the yields of their land, in order to generate income. They generally have diversified their sources of income, in order to reduce the risk of zero income, and try to find at least one salaried job, in order to ensure some stability. Many survive from remittances sent by family members who live in the United States or neighbouring countries in Central America.²⁰

Table 3 shows the results of the regression of income on different explanatory variables. The same regression has been computed on consumption, in order to compare the results. We can assume that consumption is a better indicator of permanent income than current income, given that it is more stable in time. Measurement errors of the consumption variable are probably less important than on income (Deaton, 1997 and footnote 9). Indeed, according to the R-squared, variables have a higher explanatory power on consumption than on income.

	log income		log consumption	
	coeff.	t-stat.	coeff.	t-stat.
Constant	7.167	40.089	7.263	77.656
HH size	0.072	10.426	0.038	12.465
education	0.079	16.996	0.044	21.152
female head of HH	-0.275	-6.269	-0.049	-2.579
age	0.012	1.826	0.006	2.184
age squared	-0.000	-2.260	-0.000	-2.564
log capital	0.105	8.279	0.114	20.633
log income			0.125	17.058
agriculture	-0.502	-8.284	-0.158	-5.958
livestock	-0.136	-2.042	0.132	4.567
own business	0.224	5.499	0.069	3.890
credit	0.191	3.159	0.148	5.639
urban area	0.226	4.863	0.112	5.544
Atlantic region	-0.090	-1.252	-0.202	-6.512
Central region	-0.089	-1.426	-0.282	-10.430
Pacific region	-0.060	-0.994	-0.202	-7.680
R-squared	0.293		0.571	
Adj. R-squared	0.290		0.569	
F-statistic	103.691		309.974	
No. observations	3514		3514	

Source: Nicaragua LSMS, 1998

Both income and consumption are positively influenced by **household size**, **education**, **age** of the household head (up to a certain age) and the level of

²⁰ See footnote 9.

wealth (log capital). The fact that a woman is at the **head of a household** has a strong negative impact on income; the effect on consumption is not as strong, indicating that women might spend a higher proportion of their income on their family's consumption than men.

The binary variables "agriculture", "livestock" and "own business" indicate whether households have an income from that activity. The alternative to those three options is the household who lives only on labour wage income, or other sources. 22% of households live (partly or entirely) on income from their own agricultural production, 15% live on cattle breeding and 37% on their own small non-farm business.

Results of the regression show that households who live on **agriculture** had in that year a relatively lower income than those living on a labour wage. The effect on consumption has also been negative due partly to the lower income, but also to less food crops for autoconsumption. The negative effect of the variable "agriculture" has been stronger on income than on consumption. Taking the whole sample, the consumption to income elasticity is quite low ($\frac{\partial C}{\partial Y} \frac{Y}{C} = 0.125$).

Those who live mainly on **livestock** breeding also have had a negative effect on their income in that year. Indeed, the adverse conditions for agriculture have probably also affected livestock production. Nevertheless, the effect of livestock holding on consumption is positive, given that on average, these households are better off than those who live only on agriculture. The ownership of a **family business** has a positive effect both on income and consumption.

Those who have obtained a **credit** in the year have been better off, in terms of income and consumption, than those who have not. But it is difficult to establish a causality relation, because of the endogeneity problem. A probit regression, whose results are not shown here, of the binary variable "credit" on different explanatory variables shows that "credit" is positively influenced by log income, log capital and the ownership of a non-farm family run business. It is negatively influenced by age of household head and the Atlantic region (which is the more isolated and less densely populated region of the country).

Finally, **location** variables show that the variable "urban area" has a stronger explanatory power on income, than regional differences. We would have expected that households who live around the capital city, Managua (the reference region) have more opportunities to generate income. Nevertheless, given that there has been a negative shock on agricultural production, the variable "urban area" outweighs the regional differences. The regression of log consumption on those regional variables shows a structural difference in living conditions between the capital city and the rest of the country.

3.3 Composition of household portfolio

Different types of households may have different types of assets, due to their economic activity, regional characteristics and other parameters. In this section, we look at the composition of the portfolio of non financial assets: land, livestock, equipment for agriculture, housing, durable goods (TV, bicycle, car, electrodomestic items, etc.), business inventory, etc., according to different char-

acteristics like location (rural/urban), ownership of land and level of consumption (poverty measure).

The first column in **table 4** shows the asset allocation over all households in the sample, and the mean value of each type of asset among those who own that asset. For example, livestock represents 9% of the wealth held by all households in the sample; those households who own livestock have a mean value of C\$ 16'856 of that asset. Obviously, the highest proportion of assets is held in housing and land.

Table 4: Mean value of assets by type of asset, and portfolio allocation, according to location and land ownership

mean (C\$) <i>% of column</i>	total	rural	urban	land owner	land- less
livestock	16'856 <i>9.0</i>	13'530 <i>13.8</i>	42'487 <i>5.6</i>	17'933 <i>16.1</i>	3435 <i>0.0</i>
durables	5015 <i>8.0</i>	1782 <i>2.9</i>	7730 <i>11.8</i>	2761 <i>2.7</i>	6280 <i>14.5</i>
housing	29'523 <i>37.7</i>	15'416 <i>20.2</i>	39'975 <i>50.5</i>	16'786 <i>14.5</i>	36'967 <i>67.8</i>
inventory	15'782 <i>8.4</i>	4224 <i>1.4</i>	20'146 <i>13.4</i>	5960 <i>1.1</i>	18'292 <i>17.7</i>
land	84'729 <i>33.8</i>	77'049 <i>56.6</i>	150'173 <i>17.2</i>	84'729 <i>60.1</i>	0 <i>0.0</i>
agriculture equipment	5219 <i>3.0</i>	4816 <i>5.1</i>	8889 <i>1.5</i>	5553 <i>5.4</i>	3163 <i>0.0</i>
total	57'707	56'504	62'949	92'607	41'237

Source: Nicaragua LSMS, 1998

The relative weights of assets differ between **rural and urban** populations, the former having relatively more land and cattle than the latter. Nevertheless, the mean values of livestock and land are much higher for the urban population, indicating that wealthier farmers live in the cities. Family businesses are much more important, in terms of wealth, in urban than in rural areas, corresponding to a higher density of population and a higher demand for produced or sold goods.

If we look at the difference between households who **own land and those who are landless**, we see that the latter allocate their assets between housing and inventory, while the former own mainly livestock and land. Landowners are wealthier, on average, than those who are landless.

Surprisingly, in **table 5**, a comparison of the asset allocation between **poor and non poor households** (classified according to poverty lines presented in section 3.2) shows that the poorest households (in terms of consumption) have the highest proportion of land in their asset portfolio (67.8%). One would have expected that the poorest part of the population does not own land. There are two possible explanations for the fact that the poorest have relatively more land than the less poor. First, the agricultural production was low in the survey

year, because of drought and diseases, which would explain a seasonal, rather than a structural poverty.

Second, the agrarian reform in the 1980's benefited those households who were previously landless, but working in the agricultural sector and living in rural areas. These households have received a good deal of support from the Sandinist Government and from international development aid during the years of civil war. They may have been hit more strongly than others by the defeat of the Sandinists in 1990 and by structural adjustment programs imposed by the IMF on the new governments.²¹ Overall poor have more cattle than the extreme poor, which indicates that the ownership of livestock ensures a certain security to the household in times of bad harvest. Non-poor are characterized by much higher mean values of all assets, compared to the extreme poor and overall poor.

Table 5: Mean value of assets by type of asset and portfolio allocation, according to poverty level of household

mean (C\$)	total	extreme	overall	non
<i>% of column</i>		poor	poor	poor
livestock	16'856	4426	9487	34'922
	<i>9.0</i>	<i>7.4</i>	<i>13.4</i>	<i>8.2</i>
durables	5015	332	929	8222
	<i>8.0</i>	<i>0.9</i>	<i>3.0</i>	<i>9.7</i>
housing	29'523	8779	13'176	43'783
	<i>37.7</i>	<i>20.7</i>	<i>35.9</i>	<i>41.5</i>
inventory	15'782	1765	2348	21'052
	<i>8.4</i>	<i>0.6</i>	<i>1.9</i>	<i>9.8</i>
land	84'729	62'932	39'596	141'965
	<i>33.8</i>	<i>67.8</i>	<i>41.5</i>	<i>28.0</i>
agriculture	5219	1602	2751	10'610
equipment	3.0	2.8	4.3	2.7
total	57'707	32'778	28'400	81'258

Source: Nicaragua LSMS, 1998

The above comparisons of asset portfolios among different stratus of the population show that there is no limitation on asset ownership. All households among all sub-samples possess all types of assets, except for households without land and cattle. What differs significantly across groups are the mean values of the different assets and the diversity of choices. This difference might be explained by the fact that it is easier to purchase a car for people who live in the city and easier to buy land for people who live in rural areas.

²¹Molenaers (2002) compares two rural communities in a same region of Nicaragua, in terms of social capital and its effect on criminality, distribution of land and success of development programs. The community which has benefited from the agrarian reform is worth off than the community where land ownership has been traditionally more equal, and hence, where people have not benefited from the agrarian reform.

4 Empirical results

Equations (1) and (2) will be estimated on the entire sample, and on two types of sub-samples, rural/urban and landowners/landless. The comparison of landowning and landless households will allow to verify the repeatability of the theoretical model in Dauner (2004b) to households who do not own land. Moreover, the comparison of the regression in urban and rural areas might contribute to identifying fundamental differences in the saving behaviour of these two populations.

4.1 Determinants of households' saving rates

The regressions of equation (1) yield high R-squared for the whole sample and the sub-samples, showing that the econometric model performs relatively well (**table 6**). The highest R-square is obtained for the regression on the sub-sample of landowning households. The estimated coefficients are almost all significantly different from zero, although some yield different signs than those predicted by the model (compare equation (1) in table 1 with the results in table 6). The regression on the whole sample presents the predicted signs for **income**, **capital**, the **dependency ratio** and the **household size**: saving rates increase with income and decrease with the capital, the dependency ratio and household size. These coefficients do not vary much in sign and significance in the different sub-samples.

Additionally to the assumption that households save less the more **productive capital** they have, an empirical explanation might be that if current income are low, households take hold of their capital in order to maintain their level of consumption and the wealthier they are, the more they can compensate for the income loss.

The variable **drought/disease** equals 1 if the household has suffered a drought or a disease in the agricultural production, and 0 otherwise. Most landowning households have suffered from a negative shock on income, which explains why this variable is not significant in the sub-sample of landowners. Over the whole sample this result might confirm that households who predict a negative shock on income engage in precautionary saving. The differences in coefficients of that variable between the rural and urban sub-samples is difficult to explain.

All else being equal, the ownership of a **saving account** induces a lower saving rate. Those households with a saving account may have withdrawn money in order to compensate for the relatively low income in the current year. The coefficient is only significant for the whole sample and the urban sub-sample, probably because in other sub-samples, the number of saving account holders is too low.

The transaction cost on productive assets (expressed by the **land title**) was expected to have no effect on the saving rate. The results in table 6 show that in the urban sample, lower transaction costs (land title=1) induce lower saving rates. This might reflect that households who live in urban areas and own land

have sold some of their capital, in order to compensate for the loss in income. The variable land title might as well reflect the higher level of wealth, rather than the land title ownership.

Table 6: Determinants of household saving rates in Nicaragua, 1998 (OLS, t-statistic in brackets)

	Dependent variable: $\frac{Y-C}{Y}$				
	total	rural	urban	land owner	land less
Constant	-36.901 (-44.40)	-38.978 (-30.05)	-35.836 (-32.87)	-41.227 (-24.83)	-30.497 (-34.37)
saving account	-0.931 (-2.31)	-0.738 (-0.60)	-0.784 (-1.97)	-1.760 (-1.24)	-0.593 (-1.73)
land title	0.085 (0.27)	0.465 (1.17)	-1.850 (-2.96)	0.162 (0.38)	
log capital	-0.623 (-11.47)	-0.598 (-7.09)	-0.622 (-8.78)	-0.887 (-7.66)	-0.451 (-8.30)
log income	4.587 (54.05)	4.849 (37.42)	4.305 (38.49)	5.564 (36.23)	3.676 (38.90)
Dependency ratio	-0.236 (-3.34)	-0.280 (-2.27)	-0.216 (-2.60)	-0.329 (-2.22)	-0.129 (-1.84)
HH size	-0.241 (-7.49)	-0.332 (-6.63)	-0.145 (-3.51)	-0.314 (-4.99)	-0.164 (-4.94)
female head of household	0.780 (3.75)	0.594 (1.47)	0.828 (3.58)	0.980 (1.65)	0.481 (2.59)
education	-0.200 (-8.89)	-0.191 (-4.79)	-0.184 (-7.00)	-0.237 (-4.55)	-0.166 (-7.81)
age	0.009 (1.57)	0.010 (1.10)	0.008 (1.04)	0.008 (0.62)	0.007 (1.23)
credit	-0.325 (-1.15)	-0.727 (-1.30)	-0.135 (-0.44)	0.036 (0.05)	-0.328 (-1.26)
drought/disease	0.543 (2.16)	0.501 (1.45)	1.350 (3.23)	-0.317 (-0.51)	-0.116 (-0.08)
urban area	-0.986 (-4.48)			-1.259 (-2.50)	-0.839 (-3.89)
R-squared	0.480	0.501	0.451	0.521	0.417
Adj. R-squared	0.478	0.498	0.448	0.517	0.414
F-statistic	267.68	141.23	143.80	112.90	144.40
No. observations	3492	1557	1934	1256	2235

Source: Nicaragua LSMS, 1998

The variable **female head of household** shows a positive effect on the saving rate, but is not significant in the rural and landowner sub-samples. The results in table 3 provide evidence that female-headed households have lower income and consumption levels than male-headed households. Nevertheless, the negative effect is much stronger on income than on consumption. Hence, when

average saving rates are negative the overall effect of female-headed households on saving rates turns out to be positive.

Education usually has a positive effect on household saving rates, contrarily to the results of the regressions, which show significant negative effects over the whole sample and all sub-samples. This contradictory result might have the same explanation as for capital. If education reflects permanent income, and the negative transitory income shock has durably affected households' permanent income, the effect on saving will be negative.

The coefficient of **age** has a positive sign, but it is not significantly different from zero. This might be due to the high degree of intergenerational integration of Nicaraguan households.

The coefficient for **credit** is not significant, although credit was assumed to have a positive effect on saving rates through the promotion of investments. But in a year which has been rather bad in terms of income, households might as well have used their credit for consumption (see discussion on use of credit at the end of section 4.4). Others might have had to pay back part of their credit in the current year, which would decrease their capacity to save.

Finally, households who live in **urban areas** have lower saving rates than those who live in rural areas, although their income are higher in mean terms. People who live in the cities might be more tempted to consume, because of a much bigger variety of products to buy.

Summarizing, the results of the regression show that income has a positive effect and the level of productive capital a negative effect on saving rates. Higher transaction costs imply higher saving rates, although the empirical results are only significant for the sub-sample of urban households. Households who had a saving account in the survey year had lower saving rates than the others, probably reflecting the fact that they have used their monetary savings to ensure consumption. The coefficients of the dependency ratio and the size of the household both have negative signs as expected. Contrary to the predictions, education has a negative impact on saving rates, which might be related to the fact that education reflects permanent income and that richer households have dissaved more. Age and credit have no significant effects on the saving rates, while the location in urban areas has a significant negative sign. Finally, the variable drought/disease has positively affected saving rates, which might support the existence of a precautionary motive for saving.

4.2 Determinants of saving in a financial institution

The data sets do not provide information on the amounts of monetary deposits held by households. Hence, the variable saving account is used to explain how institutional saving is influenced by selected explanatory variables. We estimate equation (2) by a probit regression for the entire sample, and the sub-samples, reflecting location and land ownership.

The results of the econometric estimations are given in table 7. The marginal effects are shown in table 8, but we will not focus much on those, given that we are primarily interested by the signs of the coefficients, rather than their size.

Table 7: Determinants for having a saving account in Nicaragua, 1998 (probit, $P > |z|$ in brackets*)

	total	rural	urban	land owner	land less
Constant	-5.464 (0.000)	-4.158 (0.000)	-5.853 (0.000)	-6.568 (0.000)	-5.447 (0.000)
distance	0.000 (0.372)	0.000 (0.938)	0.002 (0.319)	0.000 (0.597)	0.000 (0.913)
land title	0.330 (0.115)	0.456 (0.102)	0.059 (0.867)	0.323 (0.209)	
log capital	0.194 (0.000)	0.177 (0.015)	0.195 (0.000)	0.289 (0.002)	0.194 (0.000)
log income	0.179 (0.000)	0.031 (0.751)	0.244 (0.000)	0.119 (0.270)	0.206 (0.000)
Dependency ratio	0.020 (0.520)	-0.224 (0.077)	0.047 (0.165)	-0.054 (0.592)	0.035 (0.293)
HH size	-0.044 (0.018)	-0.040 (0.307)	-0.042 (0.053)	0.007 (0.854)	-0.061 (0.005)
female head of household	-0.047 (0.643)		0.072 (0.508)	0.024 (0.954)	-0.029 (0.785)
education	0.054 (0.000)	0.050 (0.034)	0.058 (0.000)	0.062 (0.023)	0.056 (0.000)
age	-0.011 (0.002)	0.005 (0.467)	-0.016 (0.000)	-0.008 (0.374)	-0.011 (0.003)
credit	0.616 (0.000)	0.593 (0.019)	0.617 (0.000)	0.902 (0.000)	0.559 (0.000)
drought/disease	-0.570 (0.002)	-0.690 (0.009)	-0.566 (0.044)	-0.410 (0.165)	
insecurity	-0.246 (0.499)	-0.344 (0.487)	0.120 (0.837)	-0.236 (0.521)	
urban area	0.224 (0.086)				
LR chi 2	366.02	44.24	245.58	77.72	238.87
Prob>chi2	0.000	0.000	0.000	0.000	0.000
Pseudo R2	0.260	0.207	0.225	0.353	0.210
No. observations	3415	1279	1900	1224	2196

(*) Coefficient is significantly different from zero if $P > |z| \leq 0.05$
Source: Nicaragua LSMS, 1998

Nevertheless, **table 8** provides important information on the explanatory power of the econometric model in the different sample and sub-samples. Actually, if we compare the observed P (*saving account=1*) and the predicted P (italic lines in table 8), we can infer that the model gives a much better explanation for the dependent variable in the sub-samples urban and landless, than in the sub-samples rural and landowners. Table 2 shows that the rural population and the landless have much lower proportions of saving account holders than

the whole population. This also explains why some coefficients in table 7 are not significant in those two sub-samples, while they are in the others. Hence, we will concentrate our discussion of results on the entire sample and the two sub-samples urban and landless.

The results in **table 7** show that the variables **income** and **capital** have positive effects on institutional savings. The variable **distance**, used as a proxy for the accessibility to a financial institution, has no impact on the probability to have a saving account, contrary to our expectations. We assumed that if people can save in a financial institution, and already have accumulated a certain amount of non financial assets, they will open a saving account. The non significance of the distance has three possible explanations: 1. Distance is not important to take a decision on institutional saving; other factors, like habit or confidence, might be more important. 2. The variable is badly proxied by the time people need to go to the place where they make shopping. 3. The distance to where they have to go anyway every week to do their shopping is not a good proxy to infer accessibility.

The binary variable for **land title**, reflecting a lower transaction cost on land, has no effect on monetary savings. Land title might not be a very good proxy for transaction costs. Actually, as seen in section 3.3, households have other assets which they can sell in case of a negative shock on income. Moreover the variable land title only applies to landowning households, who rarely save in an institution (see table 2).

Education and credit both have significantly positive and strong effects on institutional savings, as expected in the theoretical framework. Higher **education** is related to higher wealth and permanent income, but also to better knowledge and information about savings services offered by financial institutions. The effect of having a **credit** on having a saving account is extremely strong (see marginal effects in table 8).²² Although few financial institutions in Nicaragua explicitly condition access to credit on opening a saving account, clients may perceive it as an advantage to have an account, both to obtain a credit and to manage their liquidity. Having a saving account might be a necessary, but not a sufficient condition to obtain a loan.

The **dependency ratio**, indicating the proportion of "economically dependent" household members in relation to potentially income generating household members, has no significant impact on monetary savings, although it negatively influences household saving rates (see table 6). **Household size** has a significant negative effect on saving in an institution, the same as on saving rates. **Female-headed households** do not save more in a financial institution than male-headed ones.

According to the theoretical framework, the **age** of household head has no significant effect on the probability to have a saving account. The negative effect might be explained by the fact that older people in Nicaragua still have a persisting lack of confidence in financial institutions, given the economic turmoils

²²According to our calculations on the same data, the inverse is not true: having a saving account has no significant effect on having a credit.

during the years of war, when many savers lost all their money.

The variable **drought/disease** has a negative effect on the probability to have a saving account. One would have expected that households with unstable income are more likely to save money in an institution. Nevertheless, this variable might capture the characteristic of owning land (because more than 90% of landowners were affected by a negative shock on agricultural production), which has probably a negative effect on "saving account". Actually, given that the variable captures the situation of the last 12 months before the survey, even if the household would have closed the account because of the low production, the variable for saving account would still equal 1.

The fact that older people and land owning households have lower probabilities to own a saving account might have another explanation. Those who benefited from the agrarian reform also massively received credits from the State owned National Development Bank, which were being condoned after bad harvests, in order to ensure political support from that part of the population. Those households were never really motivated to save in a bank, and it might take a long time to change their habits.

Insecurity, translated by having been robbed in the last 12 months, does not have any impact on monetary savings. Either insecurity provokes contradictory reactions among households, i.e. some will save in a financial institution to keep their money secure, while others will not, because they are scared to travel to the bank carrying money in their pocket. Or the variable is not relevant to proxy an overall feeling of insecurity. Moreover, in the survey, the information on insecurity was only asked to landowning households, who anyway do not save much in banks.

Finally, the coefficient for geographical **location**, which might explain differences of access to saving services between urban and rural areas, is not significantly different from zero. Other characteristics related to living in an urban area, as income and capital, are probably the ones which matter.

All in all, wealthier households and those with higher income have more probability to own a saving account. The distance people need to reach the closest bank does not seem to matter for households' decisions to open a saving account, neither does the location in urban, versus rural areas. Education and credit have significant positive effects on monetary savings, while household size and age of household head have significant negative effects.

Table 8: Determinants for having a saving account
in Nicaragua, 1998 (marginal effects, ($P > |z|$))

	total	rural	urban	land owner	land less
distance	.00002 (.372)	.00000 (.938)	.00013 (.319)	.00000 (.597)	.00001 (.906)
land title*	.01765 (.115)	.00996 (.102)	.00526 (.867)	.00260 (.209)	
log capital	.00791 (.000)	.00271 (.015)	.01660 (.000)	.00192 (.002)	.01515 (.000)
log income	.00730 (.000)	.00047 (.751)	.02082 (.000)	.00079 (.270)	.01599 (.000)
Dependency ratio	.00082 (.520)	-.00342 (.077)	.00405 (.165)	-.00036 (.592)	.00273 (.300)
HH size	-.00180 (.018)	-.00061 (.307)	-.00357 (.053)	.00005 (.854)	-.00473 (.005)
female head of household*	-.00188 (.643)		.00631 (.508)	.00016 (.954)	-.00227 (.781)
education	.00218 (.000)	.00077 (.034)	.00494 (.000)	.00041 (.023)	.00437 (.000)
age	-.00044 (.002)	.00007 (.467)	-.00135 (.000)	-.00005 (.374)	-.00087 (.003)
credit*	.04243 (.000)	.01779 (.019)	.07766 (.000)	.01961 (.000)	.06363 (.000)
drought/disease*	-.01967 (.002)	-.01480 (.009)	-.03287 (.044)	-.00453 (.165)	
insecurity*	-.00786 (.499)	-.00368 (.487)	.01135 (.837)	-.00121 (.521)	
urban area*	.00895 (.086)				
<i>obs. P</i>	<i>.05271</i>	<i>.01642</i>	<i>.08368</i>	<i>.01797</i>	<i>.07208</i>
<i>pred. P (at \bar{x})</i>	<i>.01630</i>	<i>.00532</i>	<i>.03946</i>	<i>.00211</i>	<i>.03553</i>
LR chi 2	366.02	44.24	245.58	77.72	238.54
Prob>chi2	0.000	0.000	0.000	0.000	0.000
Pseudo R2	0.260	0.207	0.225	0.353	0.210
No. observations	3415	1279	1900	1224	2192

(*) dF/dx is for discrete change of dummy variable from 0 to 1.
Source: Nicaragua LSMS, 1998

4.3 Determinants of investing in productive assets

As explained above, the LSMS (1998) data set does not contain information on the net investment of households. Hence, we used our own 1998 survey on 300 rural households in Nicaragua, to test equation (3) in table 1. Households were asked about their actual level of physical capital²³ and about how much they had bought and sold during the last 12 months. Together with information on their level of debt, their net investment in productive assets could be computed.

The results of the regression are shown in **table 9**. The right column of the table contains descriptive information on the investment and the explanatory variables of equation (3). The average relative investment is negative and close to zero, -0.02. In 1998, an average household has almost invested nothing in net terms, which is still above the saving rate shown in table 2 (-3.39 for the sample of rural households).

The mean values of the explanatory variables reflect also differences with the ones of the LSMS, 1998, probably due to differences in the questionnaires, in the measurement of variables and in the sample areas. The proportion of households with a saving account is much higher in our sample than in the LSMS survey, 12.6% and 1.3% respectively, because it refers not only to the last 12 months before the survey, but to the last four years (1995 to 1998). Also, the three areas that we have chosen for our survey are located in the Pacific and Central regions, which differ from the overall situation of Nicaragua. The same observation applies for the proportion of households with credit; the variable refers to credits received from 1995 to 1998.

The percentage of female-headed households in our survey is of 54.7% as opposed to 15.4% in rural areas of the LSMS survey. This difference can only be explained by unequal understandings of the term household head.²⁴ Education in our sample is much smaller in mean terms (3.01) than in the LSMS sample (5.93). This has two simple explanations: first, in the LSMS, education reflects the level of education of the most educated member in the household, while in our survey it reflects the level of education of household head. Second, in the LSMS, education is expressed in number of years of schooling (1 to 16), while in our sample, it is a discrete variable, ranging from 1 for illiterates to 9 for university degree holders.

The regression of relative investment on the explanatory variables, in table 9, yields rather low values for the R-squared and the F test, given the small sample size. Nevertheless, the regression shows interesting results for the explanatory variables saving account, capital and income. Households who have a **saving account** tend to invest much less than those who have no account, which seems to support a certain trade off between financial and non financial assets. Households with a higher **income** tend to invest proportionally more, both in productive and non productive assets, as confirmed by the results in tables 6 and 7.

²³Includes housing, land, cattle, electrodomestic items, durables, etc.

²⁴In the LSMS, the household head is the person who is recognized as such by all household members. In our survey we asked for whom was taking important decisions in the household.

The coefficient of log **capital** has a significant and negative sign. Wealthier households have more assets with which they can buffer consumption and, assuming that households have faced a negative shock on income, they have used their asset buffer stock. This result may also indicate that returns on productive assets are decreasing, explaining why marginal investments decrease with the level of these assets.

Table 9: Determinants of productive investments, Nicaragua (1998)

	OLS (t-stat)	Mean (St. deviation)
Dependent variable ($\frac{I}{Y}$)		-0.02 (0.96)
Constant	-2.186 (-3.70)	
saving account	-0.506 (-2.88)	12.6%
land title	0.047 (0.37)	28.1%
log capital	-0.080 (-1.98)	10.53 (1.68)
log income	0.312 (5.75)	9.91 (1.19)
Dependency ratio	0.111 (1.647)	0.95 (0.85)
household size	-0.005 (-0.22)	6.28 (2.65)
female head of HH	-0.067 (-0.582)	54.7%
education	-0.026 (-0.87)	3.01 (2.02)
age	0.002 (0.39)	39.44 (13.97)
credit	-0.202 (-1.65)	36.8%
R-squared	0.141	
Adj. R-squared	0.109	
F-statistic	4.461	
No. observations	282	

Source of data: author's own survey in three rural regions, 1998

The **household size** has no significant effect on investments in productive assets. In order to find out whether the availability of family labour might have an effect on investment decisions, we have performed the same regression using the number of household members aged between 15 and 65. Nevertheless, this last variable does not have a significant effect on investment. Finally, we run the regression using only farm households, because for these households we could compute the total labour used in the production unit. Neither does

total available labour have a statistically significant effect on farm households' investment levels.

Summarizing, the variables which matter to explain households' decisions on investing in productive assets are income, wealth and the ownership of a saving account. The higher their income, the more they invest in productive assets. On the other side, households who have already a certain amount of productive assets invest relatively less than those who have few of them. Similarly, those who own a saving account in a financial institution, invest relatively less in productive assets, which might indicate the existence of a trade off between productive and financial assets. Finally, demographic variables like household composition, age, education, which affect saving rates, do not have any effect on productive investments.

4.4 Interest rate on loans

In order to estimate equation (4) on the relationship between households' level of capital and the interest rates on loans, we selected those households in the LSMS who had obtained a credit during the last 12 months before the survey. For those who had more than one loan, the biggest was selected to capture the information on the interest rate. We excluded 10 cases who had a capital higher than C\$ 500'000. **Table 10** shows the results of the regression of log interest rate on log capital. The coefficient on log capital is negative and significantly different from 0, showing that the less productive capital households have, the higher interest rates they pay on loans. Nevertheless, the regression yields a very low R-squared, showing that the interest rate is only very partially explained by the level of productive capital of borrowers.

Table 10: Regression of log interest rate on log capital (OLS)		
	coeff.	t-stat.
constant	2.475	6.739
log capital	-0.115	-3.231
R-squared	0.027	
Adj. R-squared	0.025	
F statistic	10.439	
No. observations	374	

Source: Nicaragua LSMS, 1998

Among all households with credit, 45.8% had a credit from a commercial bank, 26% from a non bank financial intermediary or microfinance institutions (NGO, development projects or community banks²⁵), 20.5% from a savings and credit cooperative and 7.7% from an individual moneylender. Moneylenders charge the highest interest rates (15% per month, on average), while development projects, NGOs and community banks charge the lowest rates (4% and

²⁵In the LSMS, community banks (bancos comunales) are defined as credit institutions which are managed by the beneficiaries themselves but funded by international donors.

4.3% monthly, respectively). Commercial banks charge 7% per month in mean terms and cooperatives charge around 10%.²⁶ While development projects and NGO charge the lowest interest rates, they ask the highest commission among all lenders (more than 1% of the amount lent, against less than 1% by other lenders). The longest duration of loans is obtained at commercial banks (about one year) and the shortest at moneylenders (about six months).

The two most frequent answers to the question for what households had **used their credit**, was "for emergency and household consumption" (22.4%) and to buy inventory for their shop or trade business (22.4%). Then came for investment in cattle, land, durables, machinery, furniture, etc. (21.1%), production inputs other than inventory (18.3%) and last, but not least, to pay back debts (11.4%). Investment is by far not the main reason why households ask for credits, compared to consumption and working capital. The credit terms are probably still too short for investments.

5 Conclusions

In this paper we have estimated an empirical model of household saving and investment choices in Nicaragua. The results of the estimations are summarized in table 11. We found that savings and investment behaviours do not differ significantly across sub-samples of rural versus urban households, and between farm and non farms. Nevertheless, urban households tend to have lower saving rates than rural households, and to save more in banks.

The empirical estimations provide interesting results with respect to the influence of wealth on saving rates and portfolio choices. Actually, the more productive assets households have, the less they invest in them in marginal terms, and the higher their probability to save in a financial institution. We may thus assume that financial assets substitute more and more productive assets as households become richer. Marginal returns on productive assets may decrease and returns on financial assets may thus outweigh returns on productive assets from a certain level onwards.

Increased income and wealth will definitely foster monetary savings in banks. Low income and low asset households do not hold financial assets. In that sense, the present empirical estimations contradict the findings from other studies, that poor households always keep part of their portfolio in non productive low income and secure assets. We believe however that poor households keep some in-kind and in-cash reserves at home for short term use, and that they rely on relations with relatives and friends to help them out of emergency situations, while only richer households deposit monetary reserves at the bank. Nevertheless, low-income households who do not own a business and live on salaried work may

²⁶According to our interviews with bank, cooperative, NGO officials and moneylenders, declared interest rates are much lower than those stated by households in the LSMS survey. Banks and cooperatives charge around 2% a month, NGOs between 1.5 and 3.25% a month and moneylenders between 10 and 20% a month. Households probably have overestimated the interest rates because they include all charges (commissions, forced saving, fees for late payment, etc.) in their approximation.

be interested to save in a bank, if they can afford the requirements of banks (minimum opening balance for a saving or a current account).

Table 11: Summary of empirical results

dependent variable:	$\frac{Y-C}{Y}$	saving account	$\frac{I}{Y}$
explanatory variables:			
log <i>capital</i>	-	+	-
log <i>income</i>	+	+	+
distance		0	
saving account	-		-
land title	0/-	0	0
dependency ratio	-	0	0
household size	-	-	0
female head of HH	+	0	0
education	-	+	0
age	0	-	0
credit	0	+	0
drought/disease	+	-	
insecurity		0	
urban area	-	+	
<i>data base</i>	<i>LSMS</i>	<i>LSMS</i>	<i>author's</i>

The estimations show that geographical distance is not determinant for households to save in a bank. Some interviews have stated that banks do not look attractive to them. Thus, financial institutions should make efforts to adapt their client services to the needs and habits of low income households. In Nicaragua, many microfinance institutions provide credit to small farmers and microentrepreneurs, including those in remote rural areas. Nevertheless, the legal framework does not permit them to take in deposits.

The empirical results show that, all else being equal, households who have a credit are more likely to have a saving account. We believe that these services are closely related, because reciprocity in lending is important for low income households. Microfinance institutions should be allowed to take in deposits and banks should provide credit to low income households. Meanwhile, linkage contracts between banks and microfinance institutions may provide a solution, where microfinance institutions collect savings from their clients and deposit them at the bank, and banks on the other end, provide credit lines to microfinance institutions.

Those poor households who run a business will invest all in productive assets. The higher their income, the more they invest, as long as returns on productive assets are higher than returns on financial assets. Nevertheless, the relatively high returns on productive assets are related to a somehow artificial situation in Nicaragua, but also in other developing countries: given the high level of unemployment, family labour is abundant and its cost is usually not calculated in the net returns of the business. As soon as labour becomes scarce, salaries

will increase and returns will decrease, which might foster monetary savings in banks, but also consumption. Higher education levels of households also seem important to foster bank deposits.

The empirical results on the effects of an increase of the transaction cost on saving rates, monetary savings and investment respectively are not very satisfying. Actually, the proxy we used for transaction costs, land title, only applies to landowning households and one type of asset, land. But we have seen that low income households have different types of productive assets which they can use to buffer consumption. It is difficult to imagine which indicator could be used to reflect the transaction cost on all productive assets. More conducive legal and economic environments for investments may contribute to lower transaction costs. But more "formality" may also contribute to more bureaucracy, and hence, have the opposite effect than expected.

One major limitation of the present study is the absence of panel data. The possibility to follow a cohort of households over some years would allow to draw more solid conclusions as to whether low income households accumulate assets over the long run, and whether wealthier households start saving when they are close to their equilibrium level of capital. A better measure for income is also needed, in particular the inclusion of remittances, in order to have less measurement error in income and saving. Although the number and quality of household surveys have significantly increased in recent years, still much can be done to provide more reliable and comparable data.

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Annexe: Literature from Dauner (2004a):

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