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Shocks and Social Protection: Lessons from the Central American Coffee Crisis

(In Two Volumes) Volume II: Detailed Country Cases

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ACRONYMS

ANACAFE	National Coffee Association (Asociación Nacional del Café)
BASIS	Broadening Access and Strengthening Input Systems
CCT	Conditional Cash Transfer
DIGESTYC	Dirección General de Estadísticas y Censos
EDUCO	Education with Community Participation Program (Programa de Educación con Participación de la Comunidad)
ENCOVI	Encuesta Nacional de Condiciones de Vida
FESAL	National Family Health Survey (Encuesta Nacional de Salud Familiar)
FUSADES	Foundation for Economic and Social Development
GDP	Gross Domestic Product
GON	Government of Nicaragua
IDB	Inter-American Development Bank
IFPRI	International Food Policy Research Institute
INE	National Institute of Statistics
LSMS	Living Standards Measurement Survey
MAGFOR	Ministry of Agriculture
MIFIC	Ministry of Industry and Commerce
MINED	Ministry of Education
NEUDC	Northeast Universities Development Conference
NGO	Non-Governmental Organization
PCE	Personal Consumption Expenditures
PRAF	Programa de Asignación Familiar
PROCAFE	Fundación Salvadoreña para la Investigación del Café
PROGRESA	Programa Nacional de Educación, Salud y Alimentación
RPS	Red de Protección Social
SECEP	Secretariat for Coordination and Strategy of the Presidency (Secretaría de Coordinación y Estrategias de la Presidencia)
VPCD	Vigilancia y Promoción del Crecimiento y Desarrollo

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PREFACE

Shocks are a familiar feature of the Central American landscape. Since the mid-1990s, the countries of Central America have experienced a number of natural shocks, including Hurricane Mitch (1998), earthquakes (El Salvador, 2001), and a series of seasonal droughts and floods (often associated El Niño and La Niña); as small open economies, the Central America countries are also open to a variety of economic shocks, whether in the form of external terms-of-trade shocks, like that associated with the recent "coffee crisis", policy-induced terms of trade changes, like those that will accompany the Central America Free Trade Agreement, or more generalized slowdowns in the U.S. and global economies.

This study is about the impact of shocks on people's welfare in Central America and about crafting effective public responses to shocks. It focuses on the on the lessons from the coffee crisis – an unprecedented decline in world coffee prices that occurred between 1997/98 and 2001/02. The report is part of an ongoing engagement between the World Bank and its counterparts in Central America on social protection, comprising both policy dialogue and operational support for strengthening governments' abilities to provide basic services to their poorest citizens and to protect the most vulnerable from the impacts of shocks.

This report was undertaken in response to requests from several Central American governments to better understand the impacts of the coffee crisis on households' wellbeing. A key objective of this study has thus been to bring together a rich set of new empirical evidence to enable a deeper understanding of the crisis' impacts on household income, consumption, poverty and basic human development outcomes, such as education and nutrition. To accomplish this, the study has generated a body of evidence based on an unusually rich collection of household survey data from El Salvador, Guatemala, Honduras, and Nicaragua, including – including panels of data from Nicaragua, El Salvador, and Honduras – to provide a more detailed, clearer understanding of the crisis than has been available to date.

Given the importance of shocks in the Central American context, a second key objective of the study is to draw out the broader lessons of the coffee crisis to help strengthen the abilities of governments in the region to respond to the shocks that will inevitably hit their countries in the future. To do this, the report draws both on the new findings on the coffee crisis, as well as other recent evidence from the region – on shocks and on the role and efficacy of various safety net programs – to identify a broader set of lessons regarding shocks and social protection. By learning the lessons of recent experience, the region's governments, as well as their development partners, can be better prepared to deal with a range of economic and natural shocks in the future.

To achieve its objectives, this report has been organized into two volumes. Volume I presents a synthesis of the key findings and policy implications, focusing both on the specific impacts of the coffee crisis and the more general lessons for government responses to shocks. Volume II focuses specifically on the impacts of the coffee crisis, presenting the collection of background studies commissioned specifically for this report. These background papers provide rich analytical detail on each of the four study country for readers who are interested in a more in-depth assessment of country-level impacts, in the unique data sets underlying the analyses, and/or the methodologies underpinning the analytical work summarized in Volume I.

SHOCKS AND COFFEE: LESSONS FROM NICARAGUA

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ABSTRACT

Using household level panel data from Nicaragua, this paper explores the impact of the recent coffee crisis on rural households engaged in coffee production and coffee labor work. Taking advantage of the panel structure of the data, a number of findings emerge: (i) while overall growth between 1998 and 2001 was widespread in rural Nicaragua, coffee households saw large declines in various socioeconomic outcomes; (ii) among coffee households, it is small farm households that were affected the most and not poor labor households as previously expected; (iii) even though coffee households used various risk management strategies to address the shock, it was pre shock, ex-ante strategies (like income diversification) that were the most effective in allowing coffee households insulate against the shock. By contrast, the coffee households that used ex-post coping instruments did not manage to mitigate the adverse impact as well, with additional potential long run implications via extensive uses of harmful coping strategies (like increases in child labor); and (iv) the coffee shock affected upward mobility and downward poverty vulnerability of coffee households. Such findings seem to confirm the widespread impact of shocks on overall household behavior and indicate the importance of incorporating risk management in the policy agenda of poverty reduction.

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CONTENTS

1. INTRODUCTION

Coffee is by far the most important crop for the Nicaraguan economy. It is the highest source of agricultural export revenues in Nicaragua. Specifically, during the last 5 years, coffee exports have averaged $140 million (24 percent of total export earnings).[1] It is estimated that total employment in coffee production accounts between 20 and 40 percent of the rural labor force,[2] and that more than 65% of those employed in the sector are seasonal workers.[3]

Nonetheless, for the last few years the coffee industry has been undergoing a worldwide structural change. The entry of a number of new producers in the late nineties (such as Vietnam), as well as technological improvements leading to increases in production in Latin American countries (e.g. Brazil) have dramatically increased production and as such, international coffee prices have been severely depressed.

The collapse in prices has resulted in significantly lower revenues for coffee producers in Nicaragua. Between 1998 and 2001, average price received by coffee exporters decreased from $151 to $59 per hundredweight - a decrease of 61%.[4] By 2001, the price received by coffee producers (between $45 and $50 per hundredweight) was barely sufficient to cover production costs, which are estimated to be $35, $45, and $55 (per hundredweight) for low, medium and high-technology farms.[5]

This has seriously affected the Nicaraguan coffee economy. Many farmers have been forced to reduce and even abandon coffee production altogether. In addition, there is concern about the social impact of the crisis on the coffee laborers. Initial estimates suggested that 35,000 permanent and more than 100,000 seasonal coffee plantation workers may have lost their coffee jobs.[6]

Still, the lack of in depth empirical evidence to understand the magnitude of the crisis impedes informed policy formation. Not only there is a need to better measure the impact of the shock but also identify the households that were affected the most and explore the various strategies utilized by these households to prevent, cope and mitigate the adverse effect of the crisis. A better understanding of these issues will be crucial in designing appropriate instruments for policy response.

This paper addresses these gaps in knowledge. Using a household panel data that was collected in two periods (1998 where prices were relatively high and 2001 when they were at their lowest) and by specifically exploring the sample heterogeneity to distinguish between coffee and non-coffee households, the paper describes the evolution of household-level socio-economic welfare measures between the two periods and explores the various mechanisms and strategies employed to deal with the crisis.

The paper is divided as follows: the next section describes the data and the various typologies and classifications used to define the coffee sector. An evaluation of the impact of the coffee crisis on a number of socio-economic outcomes is examined in section III, while section IV explores risk

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[1] Source: Banco Central de Nicaragua. *Indicadores Economicos Mensuales*. www.bcn.gob.ni
[2] From LSMS data on employment and agricultural production, about 20 percent of the rural labor force is estimated to be directly employed in the coffee sector while MAGFOR (2002) estimates this to be 40 percent.
[3] Inter American Development Bank (2001). The remaining 35% are permanent farm workers or farm owners.
[4] Government of Nicaragua, Ministry of Industry and Commerce (MIFIC) and Center of Export Transactions. These refer to international prices.
[5] Cf. 3.
[6] Ibid.

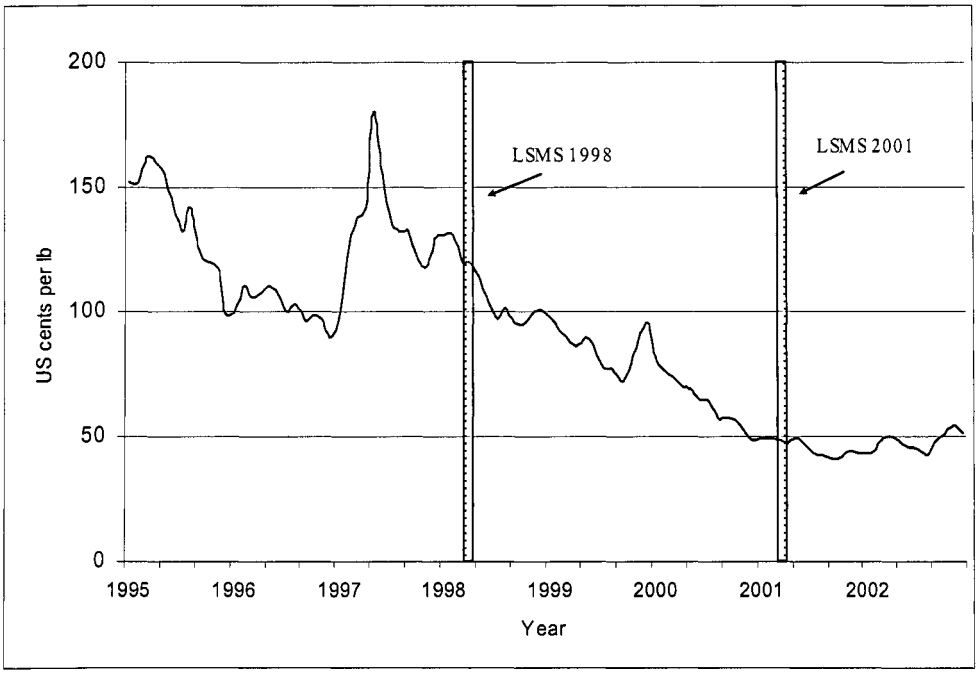
management strategies available to affected households. Section V addresses how the coffee shock may have influenced poverty mobility and vulnerability while a discussion of public policy interventions to address the crisis is presented in section VI. Section VII concludes.

2. DATA, COFFEE TYPOLOGY AND A BASELINE PROFILE OF COFFEE HOUSEHOLDS

2.1 Data sources and coffee typology

The main data source is from the *Living Standards Measurement Surveys* collected in Nicaragua in 1998 and 2001. The first survey was implemented in the summer of 1998, while the second during the summer of 2001. By then coffee prices had reached more than 60 percent of their 1998 level (Figure 1). More than 4,000 households were surveyed each year, and approximately 3,000 of those surveyed in 1998 were also interviewed in 2001. Taking advantage of the panel nature of the data, 2,993 panel households are identified for which data on aggregate consumption and income exists in both years. Since the main focus is to understand the impact of the coffee crisis (a mainly rural phenomenon), the analysis is limited largely to rural households only and focuses on a final rural panel data of 1,355 households.[7]

Figure 1: Panel timing and coffee prices (composite index)



Source: International Coffee Organization

[7] Preliminary analysis also included urban households to assess whether or not to incorporate them in the analysis. While it is likely that seasonal migration from urban to rural regions occurs during coffee harvests, the household survey reveals that most of this migration occurs within rural areas. In addition, since isolating the impact of the coffee crisis per se is a challenging issue, focusing on rural areas alone facilitates this by eliminating any systematic biases in welfare and other socioeconomic changes that could be due to urban-specific shocks.

In order to understand the impact of the coffee shock on households, a number of definitions are used to define how a household relates with coffee. The first definition focuses on household employment activities and classifies a household between "coffee" and "non coffee" based on whether any member of a household worked in the coffee sector, either as a wage earner or as a producer. Specifically, a household is defined as:

(i) *non-coffee* if it was not involved in any coffee activities in either year;
(ii) *exiting coffee* if it was only involved in coffee activities in 1998;
(iii) *entering coffee* if it was only involved in coffee activities in 2001; [8] and
(iv) *coffee* if it was involved in coffee activities both years.

The rural panel classifies 293 households involved in coffee activities in at least one of the years of the survey (Tables 1 and 2). This represents 24 percent of the rural panel households out of which one third (8 percent of the rural panel) remained in the coffee sector over the period.[9]

Table 1: Rural households coffee typology (sample sizes)

Non coffee - no household involvement in coffee activities in either year	1022
Exit coffee – involved in coffee activities in 1998 not in 2001	104
Enter coffee – not involved in coffee activities in 1998, yes in 2001	117
In coffee – both 1998 and 2001	112
Total	1355

Sources: Nicaragua LSMS 1998 and 2001; and National Agricultural Census 2001.

Table 2: Rural sample structure, extended coffee categories (sample sizes)

		2001			
		Non-coffee	Coffee-labor	Coffee farmer	Total
1998	Non-coffee	1022	62	55	1139
	Coffee-labor	66	31	11	108
	Coffee farmer	38	11	59	108
	Total	1126	104	125	1355

Sources: Nicaragua LSMS 1998 and 2001

The first definition further distinguishes *coffee households* between "labor" and "farm". This additional division is crucial as one of the key questions that this study tries to address is how the impact of the crisis compares among different types of coffee households. Using this distinction, there are 31 coffee-labor households and 59 coffee-farm households that remained in coffee both periods

[8] While observing households enter the coffee sector during this period is counterintuitive, there are two possible explanations: (i) households were already in coffee before the first survey but did not have coffee income reported in 1998 due its perennial nature; (ii) households entered immediately after the 1998 survey, when coffee prices were still high. Of the 117 households that entered the coffee sector between 1998 and 2001, 62 are labor households and 55 are small farmers.

[9] While these are weighted estimates using the rural panel, none of the two surveys was designed to represent coffee households at the national or any sub-national level, and as such these estimates should only be treated as indicative.

(Table 2). It is important to note that this latter category corresponds mainly to small-scale family farms with an average farm-size of 13 hectares and median of 5.6 hectares.[10]

A third typology defines coffee households based on their activity during the baseline year. Since households may have entered or exited the coffee sector as a response to the shock, attributing changes in various outcomes such as poverty and consumption to the coffee shock cannot be separated from the strategy to "exit" or "stay" in coffee. In this sense, the two definitions above are "endogenous" to the outcome, which poses a challenge in measuring the coffee shock's impact. While this is not always the case, classifying households based on the first year's (1998) affiliation to coffee is used in the empirical analysis as an instrument for the two previous definitions:

(i) *non-coffee* if it was not involved in any coffee activities in 1998;
(ii) *coffee labor* if it was involved in coffee labor activities in 1998; and
(iii) *coffee farm* if it was involved in coffee farming activities in 1998

Based on this definition, in 1998 there were 108 coffee-labor households, 108 coffee-farm households and 1139 non-coffee households (Table 2).

A final broader coffee classification that also serves for robustness checks is established using a geographical based index of coffee intensity. The small sample size of coffee households using the previous definitions raises a concern about empirical inferences that could be made. In addition, given that there are possibly spillover effects between the coffee and non-coffee sectors, it is important to be able to assess the impact of the coffee crisis on a more heterogeneous group of households irrespective of their direct involvement in coffee.[11] As such, using the 2001 *Censo Nacional Agropecuario* (Agricultural Census), a municipality-level intensity of coffee production is defined as the share of land dedicated to coffee cultivation. The benefit of such geographical definition is that it addresses the concerns above and serves as robustness check for the results obtained from the household definitions but can also look at the geographical aspects of the impact (if any). Using the distribution of coffee intensity three coffee regions are defined (low, medium, high).[12] Based on the regional coffee definition, 288 households (21 percent of the rural panel) reside in the high coffee region (Table 3). Box 1 summarizes the four definitions above.

[10] As neither of the two household surveys was designed to represent coffee households at the national or any sub-national level, any conclusions should not be interpreted strictly as representing all coffee households in Nicaragua.

[11] For example, while the coffee crisis may directly affect the incomes of agricultural workers, producers and anyone else involved in the production and marketing chain of coffee, it may also affect the local non-coffee economy via lower demand for other goods or increases in the labor supply for non-coffee jobs.

[12] A municipality is defined as *Low coffee intensity* if less than 1.3 percent of the farmland is dedicated to coffee (corresponding to the first 3 quintiles of the coffee intensity variable); *medium coffee intensity* is a municipality where 1.4-10.7 percent of farmland is used for coffee production (corresponding to the fourth quintile of the coffee intensity variable); and *high coffee intensity* is a municipality where 10.8 percent or more of the total farmland is dedicated to coffee production.

Table 3: Regional coffee definition using coffee intensity (sample sizes)

Low coffee intensity (< 1.3 % of total cultivated land)	765
Medium coffee intensity (between 1.4 and 10.7 % of total cultivated land)	302
High coffee intensity (> 10.8 % of total cultivated land)	288
Total	1355

Sources: Nicaragua LSMS 1998 and 2001; and National Agricultural Census 2001.
The cultivated land percentages correspond to the quintiles of municipalities' share of cultivated land in coffee. In particular, the first 3 quintiles define the low intensity region, the fourth the medium and the fifth (highest) the high intensity region.

Box 1: Typology of rural coffee households

Household definitions			Regional definition
1	2	3	4
Any household member affiliated in coffee sector:			Coffee production intensity in municipality
Using both years	Using both years	Using initial year 1998	
Non-coffee both years Coffee-exit Coffee-enter Coffee both years	Both years: Coffee-labor Coffee-farmer	Non-coffee Coffee-labor Coffee-farmer	Low intensity region Medium intensity region High intensity region

Sources: Nicaragua LSMS 1998 and 2001; and National Agricultural Census 2001.

3. ASSESSING THE IMPACT OF THE COFFEE SHOCK

3.1 Baseline Profile: 1998

The rural panel suggests that coffee labor households were among the poorest rural groups during 1998, while coffee farmers were the wealthiest. In particular, coffee labor households were the poorest group based on consumption and income levels as well as land assets (Table 4).[13] In fact, practically all coffee labor households were poor (Table 6). By sharp contrast, coffee farmers were by far the better-off group before the crisis in terms of welfare and wealth, even compared to non-coffee households. Still, coffee farmers were the least diversified in terms of income sources (with almost 80 percent of their income derived from farming), suggesting that they would be potentially less able to protect themselves from a coffee shock.

[13] All group comparisons presented in this paper are statistically significant at the 90 percent level or more unless otherwise noted.

Table 4: Selected household characteristics, 1998

	Non-Coffee	Exit Coffee	Enter Coffee	Coffee both years	
				Labor	Farmer
Consumption per capita (cordobas)	4180	3309	3074	2259	5099
Income per capita (cordobas)	3697	3695	2820	3073	6031
Main income sources (%)					
Wage agriculture	12	37	21	65	3
Self-employment agriculture	20	29	29	11	78
Wage non-agriculture	31	17	18	7	1
Self-employment non-agriculture	14	6	8	4	2
Non labor	22	11	25	14	15
Total	100	100	100	100	100
Mean farm size (hectares)	6.5	10.0	6.4	0.7	12.8
Median farm size (hectares)	4.2	4.0	4.2	2.1	5.6

Sources: Nicaragua LSMS 1998 and 2001

Table 6: Poverty Evolution by Coffee Definitions

	General Poverty			
	Headcount rate		Level Change	% Change
	1998	2001		
Coffee labor, then exit	80.5	63.1	-17.4	-21.6
Coffee labor both years	95.5	91.9	-3.6	-3.8
Coffee farmer, then exit	69.3	61.7	-7.6	-10.9
Coffee farmer both years	60.9	67.2	6.3	10.3

Sources: Nicaragua LSMS 1998 and 2001.

3.2 Impact on poverty

Overall, the years between 1995 and 2001 are characterized by high economic growth in Nicaragua. Real GDP averaged annual growth rates of about 5 percent between 1995 and 2001, while GDP per capita grew at a rate of 2.1 percent per year.[14]

Partially in response to economic growth, overall poverty declined over this period. In particular, between 1998 and 2001, overall poverty in Nicaragua declined by 4 percent to a headcount rate of 46 percent (Table 5). Even though poverty is still an overwhelmingly rural phenomenon (as more than two-thirds of the Nicaragua's poor live in rural areas), poverty rates declined faster in rural areas than in urban areas. In 2001, 64 percent of the rural were poor (a decline of six percent from 1998), compared with only 29 percent among the urban population (a decline of less than 2 percent). Similarly, almost 25 percent of the rural population was classified as extreme poor in 2001 (a decline of 15 percent from 1998), while only six percent were extreme poor in urban areas (a decline of less than 2 percent).

[14] Cf. footnote 1.

Table 5: Poverty evolution, by coffee definitions

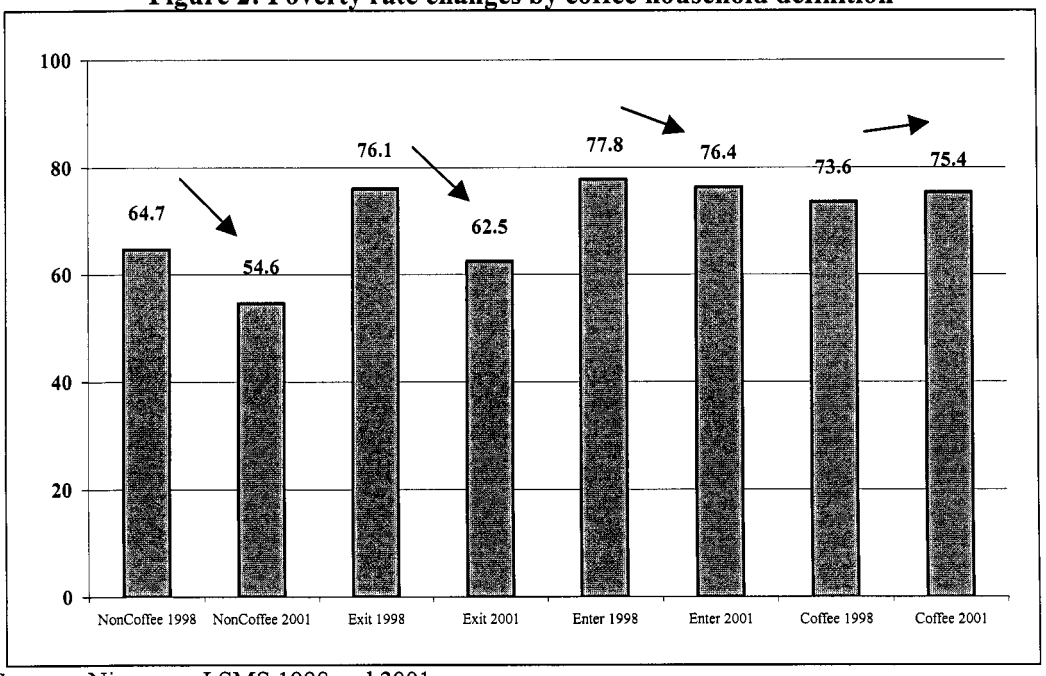
	Extreme Poverty				General Poverty			
	Headcount rate		Level Change	% Change	Headcount rate	Level Change		% Change
	1998	2001			1998	2001		
	All Households (full LSMS comparisons)							
All	17.3	15.1	-2.2	-12.7	47.9	45.8	-2.1	-4.4
Urban	7.6	6.1	-1.5	-19.7	30.5	28.7	-1.8	-5.9
Rural	28.9	24.7	-4.2	-14.5	68.5	64.3	-4.2	-6.1
	Panel households							
All	21.4	12.7	-8.7	-40.7	46.8	40.1	-6.7	-14.3
Urban	10.1	5.6	-4.5	-44.6	30.2	26.3	-3.9	-12.9
Rural	35.1	21.4	-13.7	-39.0	67.2	58.5	-8.7	-12.9
	Household Coffee Definition (rural panel)							
Non-Coffee (both years)	31.3	16.5	-14.8	-47.3	64.7	54.6	-10.1	-15.6
Coffee – Enter	56.7	43.8	-12.9	-22.8	77.8	76.4	-1.4	-1.8
Coffee – Exit	41.8	32.8	-9.0	-21.5	76.1	62.5	-13.6	-17.9
Coffee (both years)	35.3	37	1.7	4.8	73.6	75.4	1.8	2.4
	Regional Coffee Definition (rural panel)							
Low Coffee Intensity	31	13.8	-17.2	-55.5	66.1	53.5	-12.6	-19.1
Medium Coffee Intensity	35.3	22	-13.3	-37.7	60.5	54.6	-5.9	-9.8
High Coffee Intensity	46.3	41.6	-4.7	-10.2	76.9	76	-0.9	-1.2

Sources: Nicaragua LSMS 1998 and 2001; and National Agricultural Census 2001.

Nonetheless, the rural panel reveals that coffee-sector households did not benefit from these advances.[15] In particular, the poverty rate among households involved in the coffee sector in both years increased by 1.8 percentage points to more than 75 percent (Table 5 and Figure 2). Similarly, households that entered the coffee sector before 2001 observed a moderate decline in poverty of almost two percent. By contrast, poverty rates among households not involved in coffee in both years and among households that exited coffee after 1998 decreased by more than ten percentage points to 55 and 63 percent, respectively. In fact, attributing (naively) the poverty rates differences between coffee and non-coffee households on the coffee shock alone would suggest that the crisis resulted in a poverty increase of 11.9 percentage points.

[15] Note that from this point forward, all comparisons refer to the panel estimates.

Figure 2: Poverty rate changes by coffee household definition



Sources: Nicaragua LSMS 1998 and 2001.

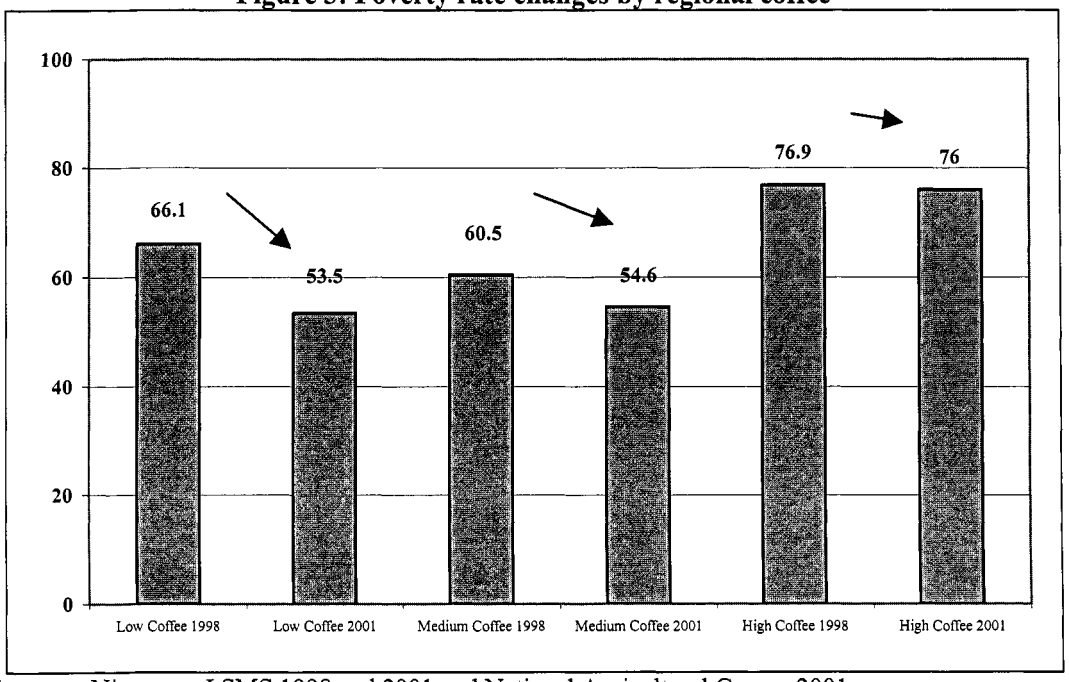
Similarly, reduction in extreme poverty was not shared among households involved in coffee activities. While extreme poverty decreased by 47 percent among non-coffee households, and by about 22 percent in households that entered and exited coffee, it increased by 5 percent among households involved in coffee in 1998 and 2001. A similar trend was observed with the regional coffee definition.[16]

Still, differentiating between farm and labor households within the coffee sector reveals that while both were affected negatively farm households were hit the most. In fact, only coffee farm households experienced increases in poverty rates (seven percent). By contrast, poverty among labor households decreased by four percent even though it did at a lower rate compared to non-coffee households (Tables 5 and 6). This implies that while coffee labor households were poorer as noted earlier, the coffee crisis shock affected them less compared to coffee farm households. Understanding and comparing the various coping strategies between the two groups is therefore crucial.

The regional coffee definition confirms the above patterns. During both 1998 and 2001, poverty in the high coffee intensity region was high compared to low and medium coffee intensity regions (Table 5 and Figure 3). Poverty rates among households in high coffee intensity regions remained above 75 percent while among households in low and medium intensity regions decreased by 13 and 6 percentage points, respectively. These trends and the corresponding impact of the coffee shock on poverty rates using this definition (a suggested impact of 11.7 percentage points) are both consistent with the household definitions discussed above.

[16] Extreme poverty declined in all regions, but the increase was more than 5 times greater among low-intensity coffee regions (56 percent) vis-à-vis high-intensity coffee regions, where extreme poverty fell by 10 percent.

Figure 3: Poverty rate changes by regional coffee



Sources: Nicaragua LSMS 1998 and 2001 and National Agricultural Census 2001.

3.3 Consumption

Between 1998 and 2001, real consumption per capita in rural areas increased an average of 11.7 percent, or 470 Cordobas (Table 7). This increase was driven mainly by an increase in consumption of non-food items (e.g., non-durable household goods, clothing, transportation, etc.) of 28.1 percent (or 9.4 percent per year). By contrast, average food consumption practically remained the same, increasing by less than 1 percent over the three-year period.

Table 7: Nicaragua: changes in per capita consumption, by coffee definitions

Type of Household	1998	2001	% Change
All Rural			
Total Consumption	4,010	4,480	11.7
Food Consumption	2,440	2,457	0.7
Non-Food Consumption	1,570	2,012	28.1
Household Coffee Definition [a]			
Non-Coffee (both years)			
Total Consumption	4,180	4,806	15.0
Food Consumption	2,515	2,609	3.7
Non-Food Consumption	1,664	2,185	31.3
Coffee - Exit			
Total Consumption	3,309	3,812	15.2
Food Consumption	2,242	2,334	4.1
Non-Food Consumption	1,066	1,478	38.6
Coffee - Enter			
Total Consumption	3,074	3,113	1.3
Food Consumption	2,019	1,763	-12.7
Non-Food Consumption	1,055	1,336	26.6
Coffee (both years)			
Total Consumption	3,881	3,248	-16.3
Food Consumption	2,285	1,771	-22.5
Non-Food Consumption	1,596	1,477	-7.5
Regional Coffee Definition [b]			
Low Coffee Intensity			
Total Consumption	4,074	4,723	15.9
Food Consumption	2,485	2,596	4.4
Non-Food Consumption	1,589	2,109	32.7
Medium Coffee Intensity			
Total Consumption	4,363	4,911	12.5
Food Consumption	2,576	2,605	1.1
Non-Food Consumption	1,787	2,304	28.9
High Coffee Intensity			
Total Consumption	3,491	3,395	-2.7
Food Consumption	2,183	1,933	-11.5
Non-Food Consumption	1,308	1,463	11.8

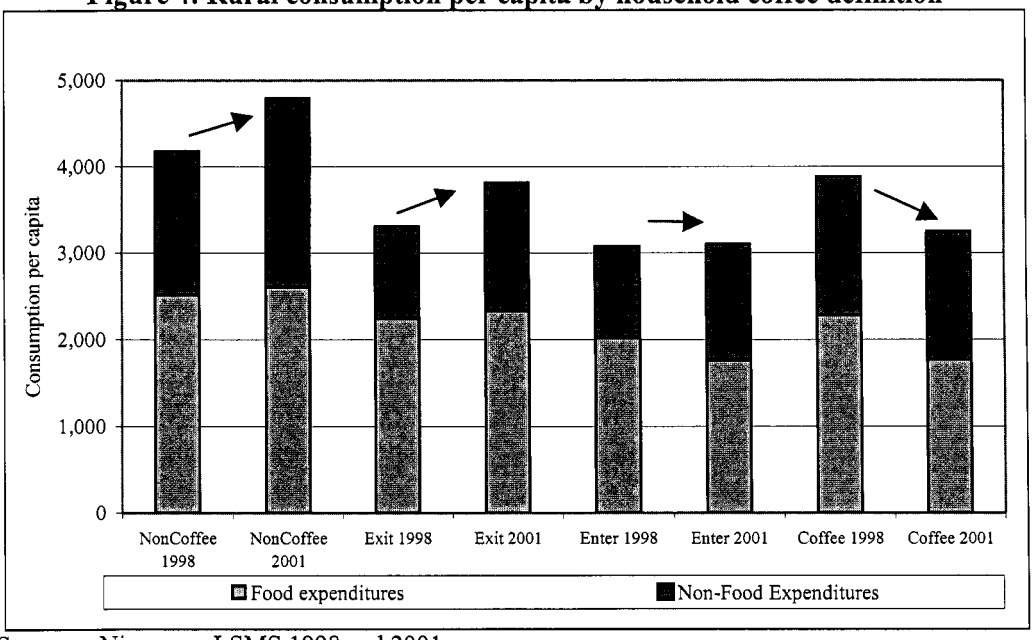
Sources: Nicaragua LSMS 1998 and 2001; and National Agricultural Census 2001. All values are in 1998 *córdobas* (C$) per capita. Average exchange rate 1998: C$10.58 / US$ 1.00.

[a] Household coffee definitions are based on the household's involvement in the coffee sector in either years. Specifically, a household is defined as: (i) coffee household if it was involved in the coffee sector in both years (112 observations); (ii) non-coffee household if it was not involved in any coffee activities in both years (1,022 observations); (iii) exiting coffee if the household was involved in coffee activities in 1998 but not in 2001 (104 observations); and (iv) entering coffee if a household was not involved in the coffee sector in 1998 but was in 2001 (117 observations).

[b] Regional coffee definitions are based on the municipal-level average of proportion of farm size dedicated to coffee production. Low = 0-1.3% (765 observations), medium = 1.4-10.7% (302 observations) and high = 10.8% or more of average farm size is dedicated to coffee (288 observations)

In contrast, households that were involved in the coffee sector in both years experienced significant declines in per capita consumption. While consumption per capita increased 15 percent among non-coffee households, it decreased more than 16 percent among coffee households (Table 7 and Figure 4). Households that exited coffee production between 1998 and 2001 experienced an increase of consumption of 15 percent, whereas consumption remained unchanged among households that entered the coffee sector after 1998.

Figure 4: Rural consumption per capita by household coffee definition



Sources: Nicaragua LSMS 1998 and 2001.

Consistent with the poverty trends above, the consumption decline was more severe among farm as opposed to labor coffee households. Consumption per capita decreased more than 25 percent among farm households while consumption among coffee labor households remained the same (Table 9).

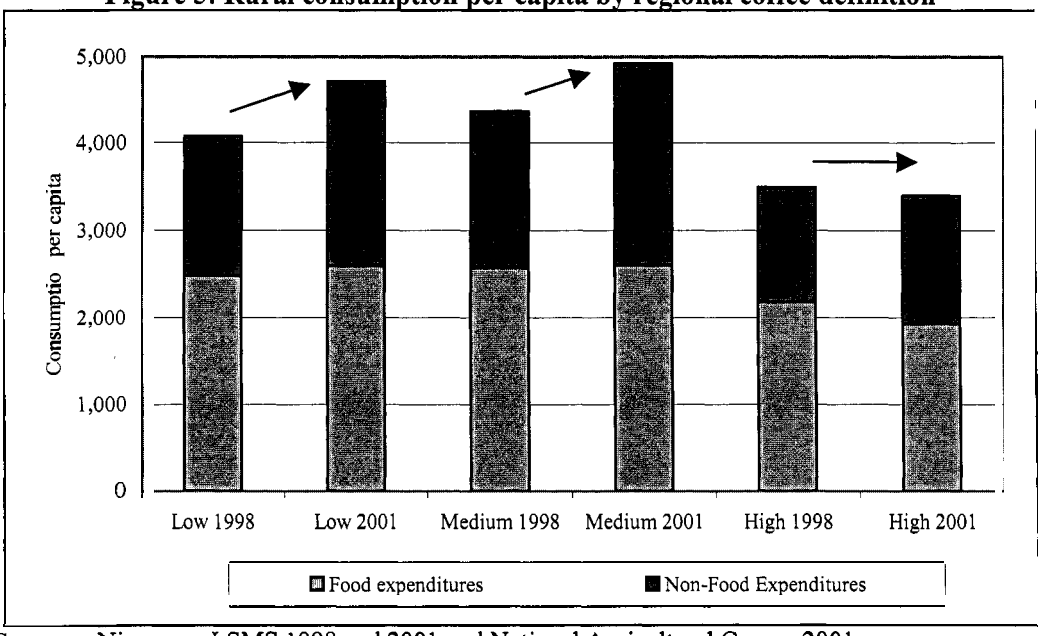
Table 9: Consumption and income among coffee households

	Consumption			
	1998	2001	Level Change	% Change
Coffee labor, then exit	3,071	3,620	549	27.6
Coffee labor both years	2,259	2,219	-40	-1.8
Coffee farmer, then exit	3,679	4,113	434	11.8
Coffee farmer , both years	5,099	3,790	-1,309	-25.7
		Income		
Coffee labor, then exit	4,019	3,990	-29	-0.7
Coffee labor both years	3,074	2,976	-98	-3.2
Coffee farmer, then exit	3,190	4,381	1,191	37.3
Coffee farmer, both years	6,031	3,696	2,335	-38.7

Sources: Nicaragua LSMS 1998 and 2001.

Similar patterns are observed using the regional coffee definition. In particular, total consumption per capita in low-intensity coffee areas increased by almost 16 percent between 1998 and 2001, in contrast with a 3 percent decrease in high-intensity regions (Figure 5).[17] This finding is consistent with the evolution of poverty within these regions.

Figure 5: Rural consumption per capita by regional coffee definition



Sources: Nicaragua LSMS 1998 and 2001 and National Agricultural Census 2001.

The drop in overall consumption of coffee households was driven by a decline in food consumption. Decomposition of consumption per-capita into its food and non-food components allows the identification of the source in consumption changes. For non-coffee households, while food consumption was similar between 1998 and 2001, the non-food component increased by more than 30 percent (Figure 4 and Table 5). Conversely, while coffee households experienced drops in both consumption components, the largest drop was in food consumption (23 percent). Similar patterns hold using the regional coffee definition.

3.4 Income

Mirroring the previous patterns, coffee households experienced large declines in incomes. Overall, between 1998 and 2001 real rural incomes per capita increased by 30 percent. Still, comparisons using the coffee definitions reveal distinct differences for each subgroup. For example, income per capita increased by 40 percent for non-coffee households (Table 8 and Figure 6). Similar increases are found in the low intensity coffee region. By sharp contrast, households involved in coffee in both periods suffered a decrease in per capita income of more than 25 percent.

[17] This decrease was not statistically significant.

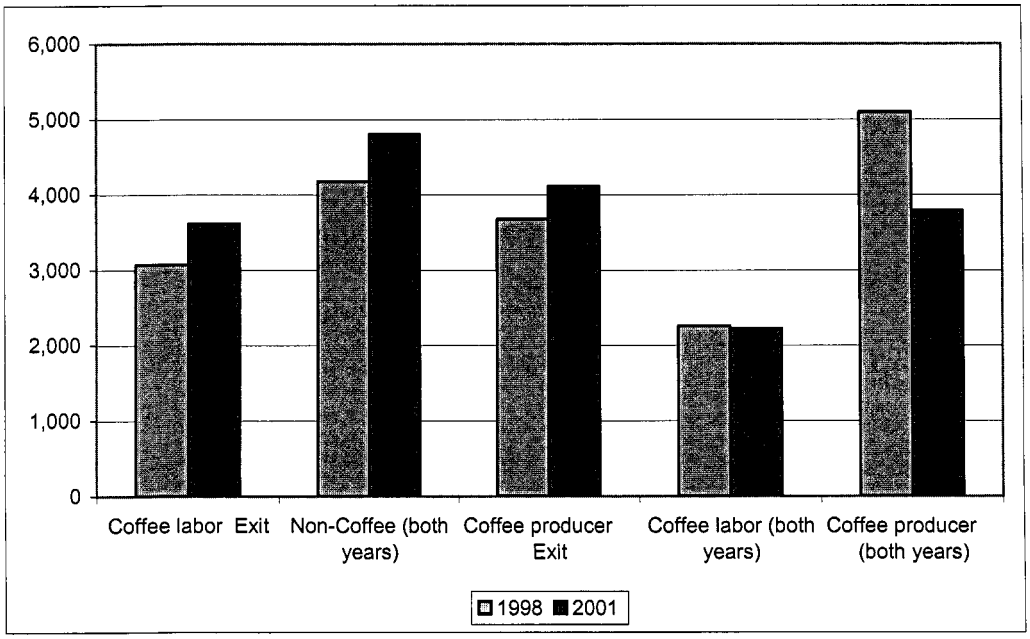
Table 8: Nicaragua: Changes in per capita income, by coffee definitions and income sources

	Household Coffee Definition [a]											
	Non-Coffee			Exit			Entry			Coffee		
Source of Income	1998	2001	% Change	1998	2001	% Change	1998	2001	% Change	1998	2001	% Change
Wage agriculture	452	567	25.4	1,367	901	-34.1	598	1,104	84.6	864	829	-4.1
Self-employment agriculture	736	1,359	84.6	1,058	1,155	9.2	806	1,165	44.5	2,688	1,358	-49.5
Wage non-agriculture	1,163	1,446	24.3	622	1,050	68.8	506	648	28.1	134	181	35.1
Self-employment non-agriculture	532	918	72.6	235	434	84.7	212	333	57.1	139	381	174.1
Non labor	814	894	9.8	413	600	45.3	698	493	-29.4	705	563	-20.1
Total	3,697	5,184	40.2	3,695	4,140	12.0	2,820	3,743	32.7	4,530	3,312	-26.9
	Regional Coffee Definition [b]											
	Low Intensity			Medium Intensity			High Intensity			All Rural		
Source of Income	1998	2001	% Change	1998	2001	% Change	1998	2001	% Change	1998	2001	% Change
Wage agriculture	471	613	30.1	476	558	17.2	898	852	-5.1	563	652	15.8
Self-employment agriculture	846	1,583	87.1	605	891	47.3	1,454	1,067	-26.6	925	1330	43.8
Wage non-agriculture	1,018	1,221	19.9	1,322	1,813	37.1	592	800	35.1	990	1254	26.7
Self-employment non-agriculture	504	839	66.5	542	958	76.8	234	516	120.5	455	795	74.7
Non labor	785	863	9.9	871	887	1.8	621	617	-0.6	768	816	6.3
Total	3,624	5,119	41.3	3,816	5,107	33.8	3,799	3,852	1.4	3,703	4,849	30.9

Sources: Nicaragua LSMS 1998 and 2001; and National Agricultural Census 2001.

All values are in 1998 córdobas (C$) per capita. Average exchange rate 1998: C$10.58 / US$ 1.00.

Figure 6: Changes in per capita income



Sources: Nicaragua LSMS 1998 and 2001.

Nonetheless, coffee farm households were hit the worst. In fact, while they had the highest average incomes per capita in 1998, by 2001 it was among the lowest. Using the household coffee definition, income per capita for coffee farm households was 6,031 Cordobas, compared to 3,697 for non-coffee households in 1998 (Tables 8 and 9). This pattern completely reversed in 2001 with coffee farm households experiencing a 40 percent decrease in incomes while non-coffee households saw a 40 percent increase in incomes. On the other hand, incomes for coffee labor households changed little between the 2 periods (Table 9), to a large part reflecting the price effect on agricultural income.

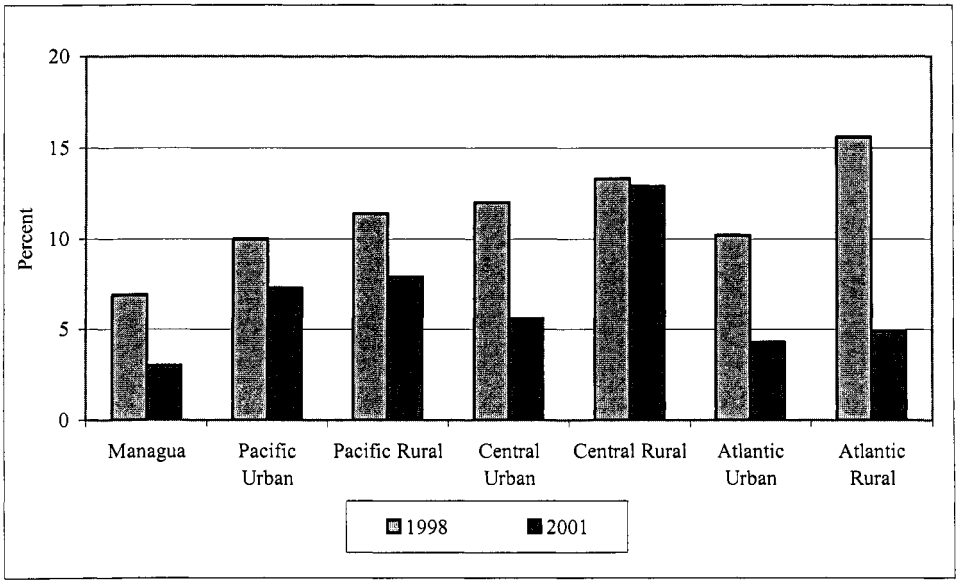
3.5 Health and Education

Child malnutrition remained unchanged within coffee regions between 1998 and 2001. Despite the fact that overall, incidences of various malnutrition measures such as stunting, wasting and underweight showed improvement during the period (national declines of 35, 11, and 73 percent, respectively), these gains were not enjoyed equally by children of all regions.[18] As figures 7 and 8 reveal, the Central Rural region - where more than 80 percent of Nicaragua's coffee production is concentrated - the incidence of underweight children changed very little while for chronic malnutrition (stunting) actually appears to have slightly increased. Both malnutrition incidences for the Central Rural region were the highest in the country during both periods and these trends suggests

[18] Stunting (height-for-age) reflects chronic malnutrition, which results from years of retarded skeletal growth and is associated with poor economic conditions; wasting (weight-for-height) captures deficiencies in fat tissue and indicates food loss from a short-term, emergency situation; and underweight (weight-for-age) combines the previous two measures and reflects total malnutrition. A child (of usually 5 years or less) is considered "stunted", "wasted" or "underweight" if his/her corresponding anthropometric measure is two or more standard deviations below the median of the internationally recognized reference population. Also see Marini and Gragnolati 2002, and Chawla 2001.

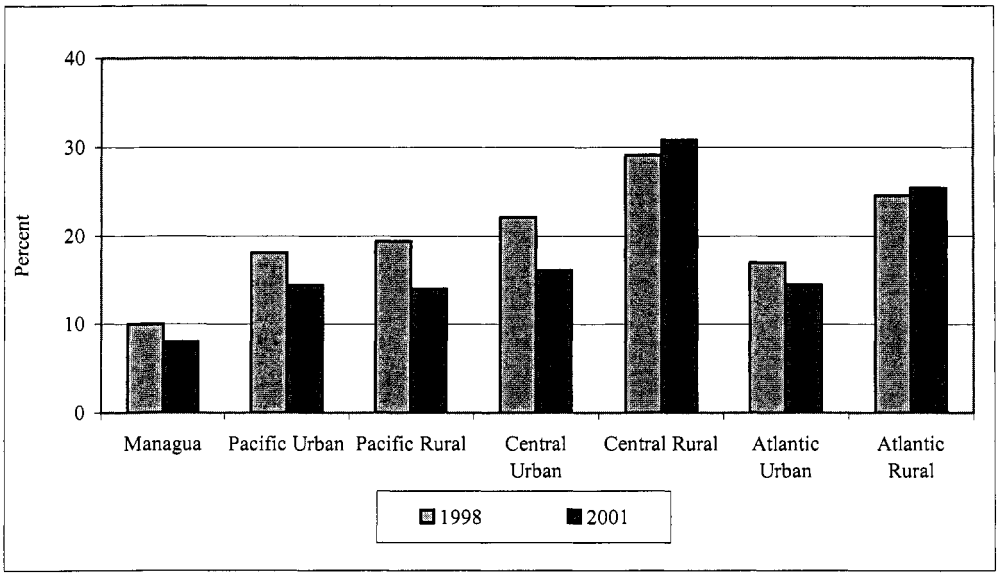
that the coffee crisis had a negative effect on the nutritional status of children younger than 5 years in the region (in the sense of at not enjoying the gains experienced elsewhere).

Figure 7: Incidence of Underweight Children, 1998 – 2001



Sources: Nicaragua LSMS 1998 and 2001.

Figure 8: Nicaragua - incidence of Stunting, 1998 – 2001

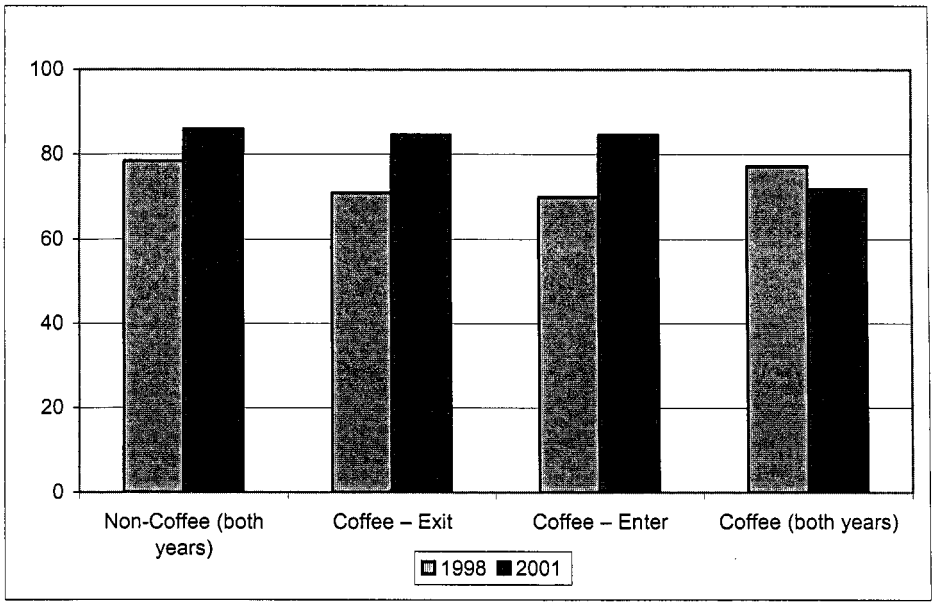


Sources: Nicaragua LSMS 1998 and 2001.

In educational outcomes, despite large increases in enrollment rates at both the primary and secondary levels, overall, primary enrollment rates among coffee households fell and secondary enrolment rates hardly changed between 1998 and 2001. Among non-coffee households, primary net enrollment rates increased from 78 to 86 percent (Figure 9). By contrast, enrollment rates among

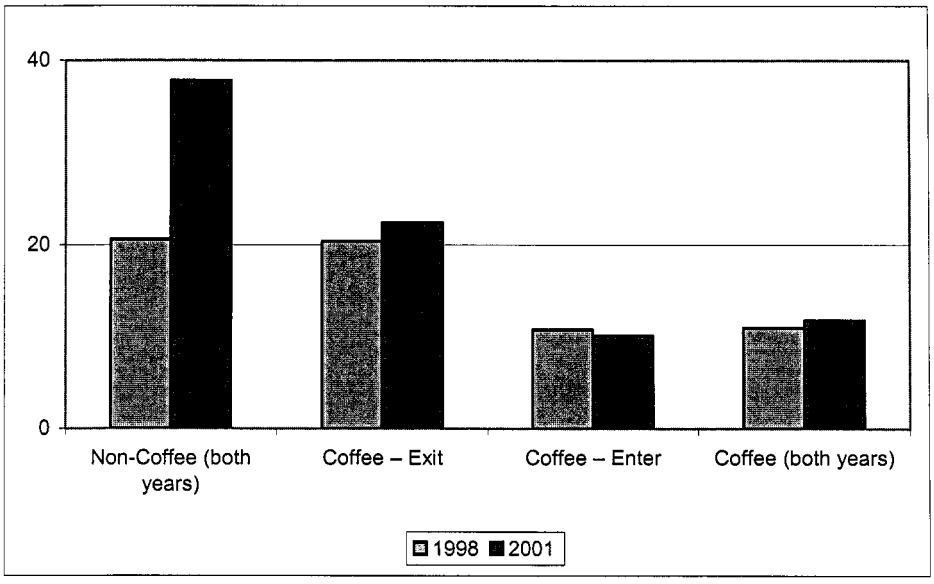
households involved in the coffee sector in both periods decreased from 77 to 72 percent. At the same time, secondary net enrollment rates almost doubled among non-coffee (to 40 percent), while remaining essentially unchanged among coffee-sector households over the period (at around ten percent; Figure 10). While not attributing these differences solely on the coffee crisis, it is possible that these patterns reflect harmful coping strategies among coffee households. The next session addresses this issue in more detail.

Figure 9: Rural net primary enrollment rates (7-12 year olds)



Sources: Nicaragua LSMS 1998 and 2001.

Figure 10: Rural net secondary enrollment rates,(13-17 year olds)



Sources: Nicaragua LSMS 1998 and 2001.

In summary, descriptive statistics suggest that households related to coffee activities did not benefit from an otherwise period of growth in Nicaragua. In fact, most socio-economic indicators for these households have worsened between 1998 and 2001, a period that saw coffee prices declined by more than half. While accurately quantifying the impact that the coffee shock may have had is challenging, the big magnitude cast little doubt that the coffee shock had a strong impact on coffee farm households and to a smaller effect coffee labor households. The next section explores the various strategies that these households used to mitigate, cope or prevent the shock and the extent by which informal insurance mechanisms to smooth consumption were available.

4. RISK MANAGEMENT STRATEGIES AND RESPONDING TO SHOCKS

4.1 Do households self-insure?

The role of risk and insurance on household behavior is well documented in the literature.[19] As poor households make consumption decisions in uncertain environments, they face many risks: idiosyncratic risks that affect a specific household (illness, death, unemployment); or covariate risks that affect everyone within a particular region or group (droughts, hurricanes, terms of trade shocks or macroeconomic volatility). The question as to whether some households are better able to use formal or informal mechanisms to minimize the impact of such risks on their consumption is therefore key in designing policies that provide insurance or safety nets mechanisms.

The previous section revealed that coffee households were adversely affected by the coffee shock in terms a number of different welfare dimensions. In the context of the coffee shock a number of questions arise: were affected households able to protect against the negative income decline? How does their ability to insure (or not) compares with non-coffee households? Are there differences among coffee households?

A number of empirical approaches have been used that address these questions of self-insurance and consumption smoothing. The most common is to fit an equation that looks at how changes in consumption correlate with income changes.[20] The typical specification is derived from a consumption equation of the initial form:

$$\ln C_{it} = \alpha + \beta \cdot \ln Y_{ti} + \gamma \cdot X_{it} \cdot + \eta_i + \omega_{it} \qquad (1)$$

where $\ln C_{it}$ is the log of consumption per capita of household i in period t, $\ln Y_{it}$ is the log of income at time t, X_{it} is a vector of socio-economic characteristics, α, β and γ are parameters to be estimated, η_i is a household fixed effect and ω_{it} is an i.i.d. error term.

By differencing equation 1 (between the two years), the specification becomes:

$$\Delta \ln C_i = \alpha + \beta \cdot \Delta \ln Y_i + \gamma \cdot \Delta X_i \cdot + \omega_i \qquad (2)$$

where Δ denotes changes over the two periods of the respective variables. Estimating equation 2 will give unbiased estimates of the coefficients.

[19] For example, Alderman and Paxson (1992), Townsend (1994), Jalan and Ravallion (1999).
[20] See Townsend (1994), Ravallion and Chaudhuri (1997) and Grimard (1997) for some examples.

The basic test of consumption insurance is the extent to which household income co-varies with consumption. If households are fully insured against income shocks, then changes in income do not affect consumption and □=*0*. The extent to which □ differs from zero indicates how insulated (or exposed) a household's consumption is to income shocks.[21]

In the case of the coffee shock, an additional empirical challenge is to correctly model the coffee crisis since it is covariate shock that only affects a subgroup of the population. Specifically, it is important to be able to test for differentiated impacts on consumption among different types of households, based on whether they participated in coffee activities or resided in a coffee region (as defined earlier). Nonetheless, two of the coffee definitions are endogenous in the sense that the decision to enter, exit or stay in coffee is endogenous to consumption changes. As such, the final empirical strategy implemented here is to estimate coffee-group specific models using equation 2. That is, for each coffee classification, a consumption changes is regressed on income changes (ΔY) and household size changes (ΔX).[22] This avoids the endogeneity issue since the only interest is to test the specific group's ability to self-insure.[23]

The overall results reject the full insurance hypothesis. Estimating Equation (1) suggests that more than fourteen percent of an income shock is passed onto current consumption (Table 10).[24] These effects are similar by estimating this on food and non-food consumption.

[21] The intercept α captures aggregate income risk.

[22] This is a similar estimation strategy adopted by Jalan and Ravallion (1999).

[23] An alternative approach would be to estimate an augmented equation 2 using coffee dummies interacted by income changes to test the full insurance model and exploring differentiated insurance ability among various coffee categories. This approach has the advantage of using the entire sample, which is attractive due to the small sample sizes of coffee categories using the specification of equation 2. While estimating this specification resulted in similar results, they are not reported due to concerns on the endogeneity of some of the coffee classifications.

[24] These magnitudes are consistent with the ones typically found in the literature. See also Skoufias and Quisumbirng (2002).

Table 10: Consumption smoothing: income changes coefficients

	Total	Food	Non-Food
All rural	0.14***	0.14***	0.13***
Coffee definitions			
Non-Coffee	0.14***	0.14***	0.13***
Exited Coffee	0.07	0.12	-0.01
Entered coffee	0.07	0.01	0.13
Coffee labor both years	0.22*	0.43*	0.08
Coffee farmer both years	0.20**	0.12	0.34**
Initial coffee classifications			
Non-Coffee in 1998	0.14***	0.13	0.13***
Coffee labor in 1998	0.12*	0.18**	0.14
Coffee farmer in 1998	0.19***	0.16**	0.24*
Regional coffee definitions			
Low coffee intensity	0.14***	0.14***	0.12***
Medium coffee intensity	0.14***	0.12**	0.13***
High coffee intensity	0.13***	0.11*	0.16***

Dependent Variable: Log of change in consumption per capita
Each coefficient comes from estimating a fixed effects model of consumption per capita changes regressed on income per capita changes and household size changes for the corresponding coffee classification. Both regressors are treated as exogenous. The municipal level fixed effects are jointly significant for all the specifications.
* significant at 10%; ** significant at 5%; *** significant at 1%

Estimation of equation 2 using coffee-specific models suggests that income shocks have a heterogeneous impact among different rural subgroups. For example, using the first two coffee definitions, given an overall impact of income shocks on consumption that is similar for coffee and non-coffee households, the former are significantly less able to self-insure (Table 10). Specifically, for every dollar of income decrease, coffee-labor households decrease consumption by 22 cents while coffee labor households by 20 cents.

Comparing self-insurance abilities for food consumption, the results indicate that coffee-labor households are vulnerable to insuring food consumption while coffee-farm households are not. Specifically, more than 43 percent of an income shock among coffee-labor households is passed through food consumption decreases. By contrast, among coffee-farm households, the effect is not significant suggesting that income shocks do not translate into food consumption decreases. To the extent that coffee-labor households were the poorest in both periods, these findings imply that they were also the most vulnerable to income risks. As such in improving insurance mechanisms and risk reduction in rural Nicaragua, special attention on the poorer and more vulnerable populations (such as coffee labor households) may be a priority. This finding is consistent with literature from other countries that suggest that the poorest households are also those least able to smooth consumption.[25]
The ability to insure non-food consumption against income shocks is smaller among coffee-farm households. For example, among households that remained in coffee farming in both periods, non-food consumption changes decreased by 34 cents for every dollar decrease in income. A similar pattern is observed using the other coffee household definition (even though the overall magnitude is smaller).

[25] Jalan and Ravallion (1999).

Interestingly, households that exited and entered the coffee sector seem to be able to "insure" against income fluctuations. The non-significance of the income coefficient for both groups suggests that these households were better able to insulate their consumption from income shocks (Table 10).[26] While for households that exited the coffee sector, this could be suggesting that mobility and adaptability to changing economic conditions may be important in determining how households insure against shocks, it is unclear as to why that may be the case for household that entered coffee (but the small sample sizes for both groups may explain these results). Nonetheless, as discussed below, income diversification in non-agricultural activities seems to have allowed some households to stabilize consumption patterns. Understanding the process of coffee entering or exiting may therefore be important.

4.2 Risk management strategies

Exposure to risk in general does not necessarily translate in adverse outcomes. In fact, if households have access to a sufficient portfolio of options that can allow them to manage the realization of risk (the shock), then exposure to risk is not an issue. This is not the case in most cases and the results above do suggest that rural households in Nicaragua are not able to fully protect themselves against risk exposure.

As such, a better understanding of the various risk management strategies employed by rural households to cope with risks is important. Typically it is useful to separate such strategies into ex-ante and ex-post.[27] Ex-ante mechanisms address what households (and to that extent, public and private instruments) can do to reduce or prevent the occurrence of risks and mitigate the impact of risk if an adverse event occurs. Some examples of ex-ante mechanisms are crop insurance, exiting a risky occupation, income diversification. On the other hand, ex-post mechanisms address the ability of households to respond after a risk has been realized (for example taking children out of school or selling assets). Exploring whether these risk management strategies and mechanisms exist or vary across different households is also instrumental for policy design.

This section explores what strategies, if any, have allowed rural households to address exposure to various risks, with emphasis on the coffee shock. To facilitate the analysis, in addition to ex-ante and ex-post strategies, risk management strategies are further grouped in: (i) labor market adjustments; (ii) precautionary savings; and (iii) informal insurance. In principle, all three strategies can be both ex-ante and ex-post. Finally exiting the coffee sector as a response to the shock is also considered as a coping strategy.

Empirically, there are a number of approaches to explore the role of various risk management mechanisms on household welfare. Typically, data on a household's response as a result of realized risks can be used to assess the existence and use of the various mechanisms mentioned above. Since the Nicaragua survey did not collect such information a few alternative methodological strategies are implemented. Denoting Z to be a vector of potential risk management instruments available to the household the initial period (for example assets, labor supply), the first approach entails estimating a consumption growth model of the form:

$$\Delta \ln C_i = \delta_0 + \delta_1 \cdot X_i + \delta_2 \cdot Z_i + \nu_i \qquad (3)$$

[26] Similar results were obtained with changes in food and non-food consumption.
[27] Holzmann and Jorgensen (2000).

where X_i and Z_i are as previously defined above, δ_0, δ_1 and δ_2 are parameters to be estimated and ν_i is an i.i.d. error term.

Estimating equation 3 can allow indirect inferences on the existence of a particular risk management instrument vis-à-vis consumption growth. Specifically, testing whether a specific instrument Z is correlated with consumption growth over the period is interpreted as weak evidence of a positive role for that instrument in addressing risk. For example, finding a positive relationship between the initial level of remittances and consumption growth is interpreted as evidence that migration was a potentially important strategy for households (and possibly against exposure to risk). As with the insurance models above and due to the similar endogeneity concerns, equation 3 is estimated for each of the coffee definitions separately so as to assess the existence of risk management instruments among each specific subgroup. The results are presented in Tables 11 through 19, the dependent variable being the change in total, food, and non-food consumption, respectively.

Table 11: Consumption growth and coping, by coffee household definition

	Non-Coffee	Exited	Entered	Labor-both year	Farm-both years
Baseline period household characteristics (1998)					
Family size	0.04***	0.07	0.04	0.04	0.03
Maximum years of education in household	0.02**	0.02	-0.01	0.01	-0.01
Number of kids workers	-0.01	0.00	0.03	-0.03	-0.12
Number of adult workers	-0.02	-0.13	0.07	-0.23	0.03
Number of income sources	0.04*	0.13	-0.21**	0.04	-0.17
Land owned (hectares)	0.00	-0.00	0.00	0.04	0.01
Received remittances (yes=1)	0.06	0.08	0.14	-0.15	-0.30
Distance to Managua (10 minute intervals)	-0.00	0.02	0.02	0.08	0.03
Elevation (100 meters)	0.00	0.01	0.05	-0.08	0.09
Affected by Mitch (yes=1)	0.00	0.00	0.00	0.00	0.00
Constant	-0.27**	-1.20	-0.59	-0.97	-1.35
Observations	1022	104	117	31	59
R-squared	0.23	0.55	0.74	0.86	0.55

Dependent Variable: Change in (log) per capita consumption. Additional controls: municipality fixed effects.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 12: Food consumption growth and coping, by coffee household definition

	Non-Coffee	Exited	Entered	Labor-both year	Farm-both years
Baseline period household characteristics (1998)					
Family size	0.04***	0.05	0.06**	0.02	0.01
Maximum years of education in household	0.02**	0.04	0.03	0.02	0.00
Number of kids workers	-0.00	-0.02	-0.06	0.11	0.05
Number of adult workers	-0.01	-0.07	-0.13	-0.18	0.03
Number of income sources	0.04	0.10	-0.20	0.07	-0.12
Land owned (hectares)	0.00	-0.00	0.01	-0.01	-0.01
Received remittances (yes=1)	-0.02	-0.08	0.19	-1.05	-0.36
Distance to Managua (10 minute intervals)	-0.00	0.04	0.01	0.10	0.03
Elevation (100 meters)	0.00	0.05	0.10	-0.14	0.09
Affected by Mitch (yes=1)	0.00	0.00	0.00	0.00	0.00
Constant	-0.41**	-1.79	-0.93	-1.27	-1.66
Observations	1022	104	117	31	59
R-squared	0.22	0.50	0.77	0.79	0.59

Dependent Variable: Change in (log) per capita food consumption. Additional controls: municipality fixed effects.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 13: Non-food consumption growth and coping, by coffee household definition

	Non-Coffee	Exited	Entered	Labor-both year	Farm-both years
Baseline period household characteristics (1998)					
Family size	0.04***	0.11**	0.00	0.10	0.07*
Maximum years of education in household	0.00	-0.01	-0.05	-0.05	-0.02
Number of kids workers	-0.01	-0.01	0.17	-0.29	-0.38***
Number of adult workers	-0.04	-0.23*	0.31**	-0.49	0.06
Number of income sources	0.04*	0.17	-0.24	0.15	-0.29
Land owned (hectares)	0.00	-0.00	-0.00	0.15	0.02**
Received remittances (yes=1)	0.15**	0.39	0.20	0.99	-0.23
Distance to Managua (10 minute intervals)	-0.01	0.00	0.02	-0.00	0.04
Elevation (100 meters)	0.01	-0.06	-0.04	-0.04	0.10
Affected by Mitch (yes=1)	0.00	0.00	0.00	0.00	0.00
Constant	-0.02	-0.23	0.35	0.55	-1.25
Observations	1022	104	117	31	59
R-squared	0.23	0.65	0.61	0.80	0.56

Dependent Variable: Change in (log) per capita non-food consumption. Additional controls: municipality fixed effects.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 14: Consumption growth and coping, by 1998 coffee household definition

	Activity in 1998		
	Non-Coffee	Coffee labor	Coffee farmer
Baseline period household characteristics (1998)			
Family size	0.02	0.02	0.04***
Maximum years of education in household	-0.01	0.03	0.02**
Number of kids workers	-0.00	-0.06	-0.01
Number of adult workers	-0.14	0.05	-0.01
Number of income sources	0.03*	-0.11	0.03
Land owned (hectares)	0.04	-0.00**	0.00
Received remittances (yes=1)	-0.03	0.34	0.07
Distance to Managua (10 minute intervals)	0.02	0.01	-0.00
Elevation (100 meters)	-0.01	0.09*	-0.01
Affected by Mitch (yes=1)	0.00	0.00	0.00
Constant	-0.10	-0.97	-0.20
Observations	108	108	1139
R-squared	0.61	0.44	0.22

Dependent Variable: Change in (log) per capita consumption. Additional controls: municipality fixed effects.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 15: Food consumption growth and coping, by 1998 coffee household definition

	Activity in 1998		
	Non-Coffee	Coffee labor	Coffee farmer
Baseline period household characteristics (1998)			
Family size	0.00	0.02	0.04***
Maximum years of education in household	-0.00	0.01	0.02***
Number of kids workers	-0.01	-0.01	-0.00
Number of adult workers	-0.11	0.04	-0.01
Number of income sources	-0.03	-0.01	0.02
Land owned (hectares)	0.05	-0.00*	0.00
Received remittances (yes=1)	-0.19	0.11	-0.01
Distance to Managua (10 minute intervals)	0.01	0.03	-0.00
Elevation (100 meters)	0.02	0.15**	-0.02
Affected by Mitch (yes=1)	0.00	0.00	0.00
Constant	-0.17	-2.24***	-0.29*
Observations	108	108	1139
R-squared	0.59	0.49	0.20

Dependent Variable: Change in (log) per capita food consumption. Additional controls: municipality fixed effects.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 16: Non-food consumption growth and coping, by 1998 coffee household definition

	Activity in 1998		
	Non-Coffee	Coffee labor	Coffee farmer
Baseline period household characteristics (1998)			
Family size	0.07*	0.05	0.04***
Maximum years of education in household	-0.03	0.05	0.00
Number of kids workers	0.01	-0.17*	-0.00
Number of adult workers	-0.25**	0.06	-0.03
Number of income sources	0.15	-0.27*	0.03
Land owned (hectares)	0.03	-0.00*	0.00
Received remittances (yes=1)	0.15	0.76*	0.15**
Distance to Managua (10 minute intervals)	0.01	-0.02	-0.01
Elevation (100 meters)	-0.10	0.00	0.01
Affected by Mitch (yes=1)	0.00	0.00	0.00
Constant	0.38	0.77	0.00
Observations	108	108	1139
R-squared	0.56	0.40	0.22

Dependent Variable: Change in (log) per capita non-food consumption. Additional controls: municipality fixed effects.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 17: Consumption growth and coping, by regional coffee definition

	Coffee intensity in municipality		
	Low	Medium	High
Baseline period household characteristics (1998)			
Family size	0.04***	0.05***	0.02*
Maximum years of education in household	0.01	0.01	0.03**
Number of kids workers	-0.01	-0.03	-0.00
Number of adult workers	-0.01	-0.01	-0.04
Number of income sources	0.03	0.01	0.03
Land owned (hectares)	0.00	-0.00	-0.01***
Received remittances (yes=1)	0.06	0.10	-0.02
Distance to Managua (10 minute intervals)	-0.00	-0.03**	0.00
Elevation (100 meters)	0.02	-0.04	0.01
Affected by Mitch (yes=1)	0.00	0.00	0.00
Constant	-0.26*	0.20	-0.47
Observations	765	302	288
R-squared	0.21	0.21	0.25

Dependent Variable: Change in (log) per capita consumption. Additional controls: municipality fixed effects.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 18: Food consumption growth and coping, by regional coffee definition

	Coffee intensity in municipality		
	Low	Medium	High
Baseline period household characteristics (1998)			
Family size	0.03**	0.05***	0.02
Maximum years of education in household	0.02*	0.00	0.02*
Number of kids workers	0.00	-0.03	0.00
Number of adult workers	0.02	-0.04	-0.03
Number of income sources	0.01	0.04	0.03
Land owned (hectares)	0.00	-0.00	-0.01***
Received remittances (yes=1)	-0.04	0.06	-0.15
Distance to Managua (10 minute intervals)	-0.00	-0.02	0.02
Elevation (100 meters)	0.03	-0.04	0.02
Affected by Mitch (yes=1)	0.00	0.00	0.00
Constant	-0.40**	0.12	-0.86**
Observations	765	302	288
R-squared	0.19	0.19	0.26

Dependent Variable: Change in (log) per capita food consumption. Additional controls: municipality fixed effects.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 19: Non-food consumption growth and coping, by regional coffee definition

	Coffee intensity in municipality		
	Low	Medium	High
Baseline period household characteristics (1998)			
Family size	0.04***	0.06**	0.04**
Maximum years of education in household	-0.00	-0.00	0.01
Number of kids workers	-0.00	-0.03	-0.03
Number of adult workers	-0.04	-0.01	-0.03
Number of income sources	0.04	-0.02	-0.01
Land owned (hectares)	0.00	0.00	-0.01***
Received remittances (yes=1)	0.20**	0.18	0.12
Distance to Managua (10 minute intervals)	-0.00	-0.03**	-0.01
Elevation (100 meters)	0.01	-0.02	0.00
Affected by Mitch (yes=1)	0.00	0.00	0.00
Constant	-0.00	0.49	0.20
Observations	765	302	288
R-squared	0.22	0.19	0.19

Dependent Variable: Change in (log) per capita non- food consumption. Additional controls: municipality fixed effects.
* significant at 10%; ** significant at 5%; *** significant at 1%.

A second approach is to directly test whether a household used a specific coping instrument. Empirically this can be implemented by estimating a probability model of the form:

$$\text{Prob}(\Delta Z_i = 1) = f(\sum_{k=1}^{K-1} \theta_k \cdot Coffee_{ik} + \xi_i) \qquad (4)$$

where ΔZ_i denotes a positive use of that risk management instrument. For example, ΔZ_i could be the change in a household's child labor allocation over the period. In this case, by differentiating among households based on their affiliation with coffee activities, a positive θ for say, coffee laborers, would suggest that these households were more likely to engage in harmful coping mechanisms such as child labor due to the coffee shock. To further explore coping abilities among coffee households, equation 4 is also estimated controlling for whether a household was poor in 1998, capturing heterogeneous coping ability between poor and less poor coffee households. The results for these estimations are presented in Tables 20 through 23.

The results from both approaches described above, complimented by descriptive statistics are summarized below.[28]

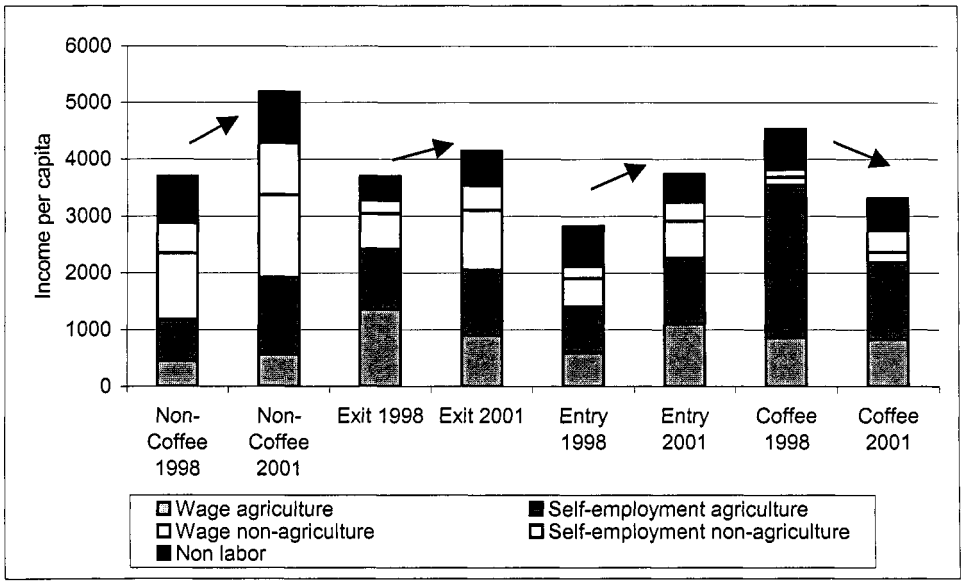
4.3 *Labor market adjustments*

Household diversification in non-agricultural activities plays an important role for rural welfare and coping with shocks. Non-coffee households that were more income diversified in 1998 (measure by the number of different agricultural and non-agricultural income sources in the household) were more likely to experience consumption growth (for example Tables 11, 13 and 14).[29] By contrast, diversification among coffee labor and farm households did not affect consumption growth. One important distinction that may explain these patterns is the observation that while non-coffee households were diversified in both agricultural and non-agricultural activities, coffee households were mainly "diversified" only within the agricultural sector (Tables 4 and 8, Figures 11-13). As such, these patterns suggest that access to non-agricultural activities may be a key instrument for both risk mitigation and consumption growth in general.

[28] All models discussed in this section also control for municipality level fixed effects, and whether the household resides in a hurricane Mitch affected municipality, the other covariate shock during this period.

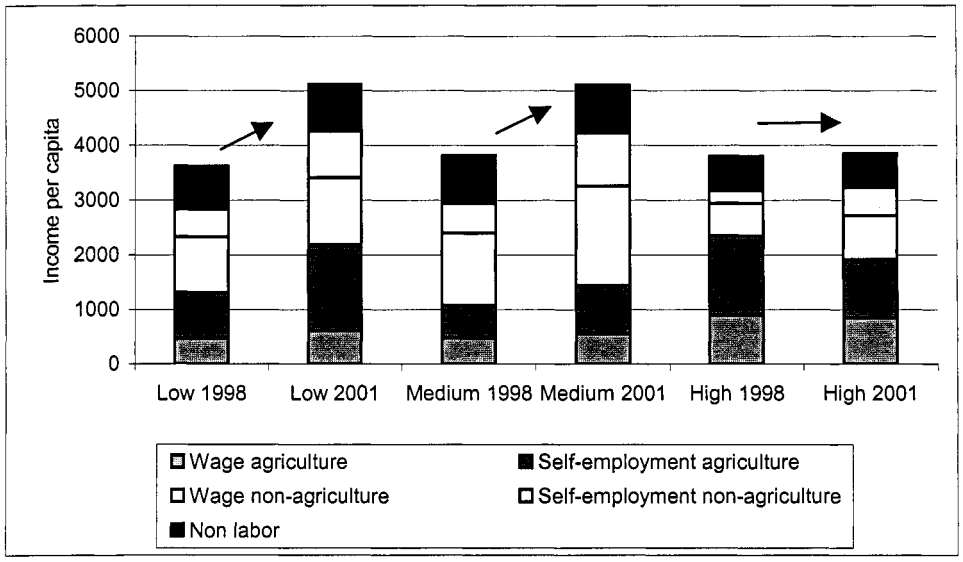
[29] This is consistent with Beneke and Gonzalez-Vega (2000) who find positive effects of income diversification on income growth in El Salvador.

Figure 11: Sources of rural income per capita by household coffee definition



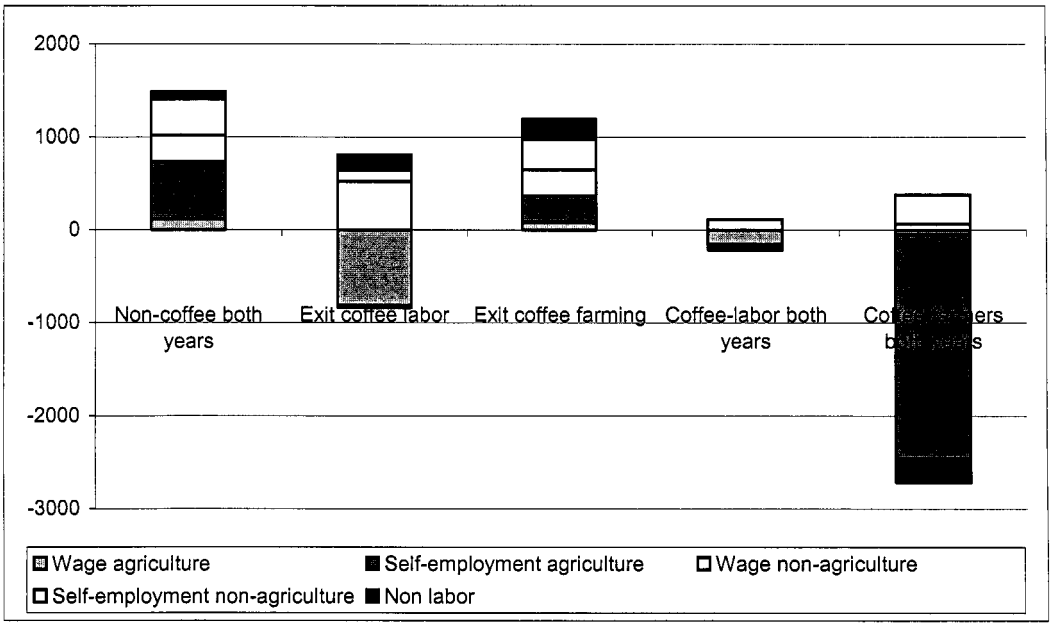
Sources: Nicaragua LSMS 1998 and 2001.

Figure 12: Sources of rural income per capita by regional coffee definition



Sources: Nicaragua LSMS 1998 and 2001 and National Agricultural Census 2001.

Figure 13: Adjustments to income by income source



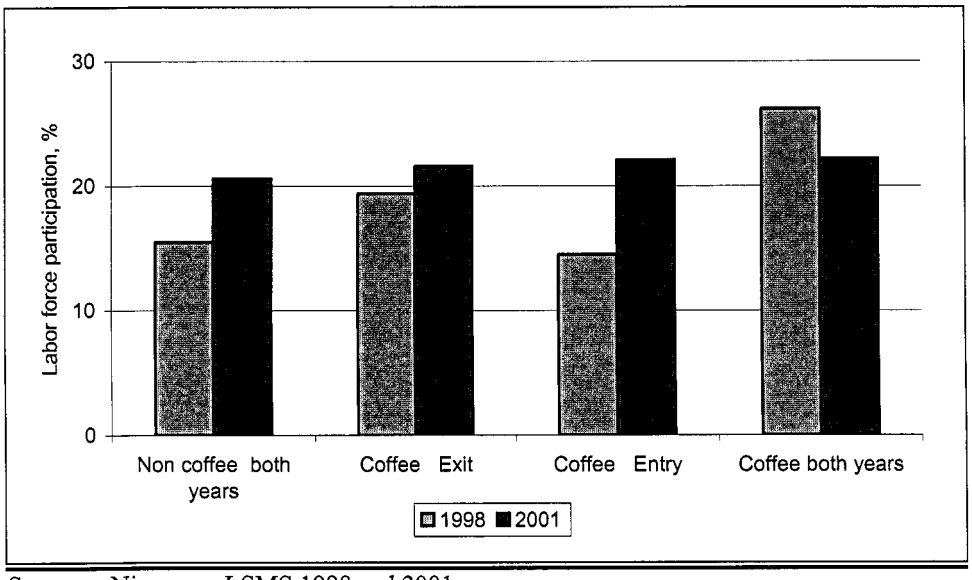
Sources: Nicaragua LSMS 1998 and 2001 and National Agricultural Census 2001.

Consistent with the above, examination of income portfolio adjustments indicates that households that increased non-agricultural incomes faired better. For example, among households that exited coffee over the period, the main income increases were due to increases in non-agricultural income (Table 8 and Figure 13). In addition, while coffee labor households who exited coffee mainly diverted their efforts to non-agricultural labor (wage) activities, coffee farm households that exited coffee shifted labor to non-agricultural enterprises (self-employment). This is indicative of the constraints for poorer households (coffee labor) to take advantage of higher return occupations in the non-agricultural sector. Nonetheless, the fact that these households did exit coffee highlights the importance of understanding the determinants of both upward income mobility and the ability to diversify into non-agricultural activities.

The empirical results also imply that coffee households engaged in harmful coping activities via increases in child labor, directly affecting school enrollment. Over the period of the study, child labor incidence increased in rural Nicaragua by 24 percent (Figure 14). While this incidence has decreased among coffee households (Figure 14), the average total weekly hours worked by children among coffee households significantly increased compared with a decrease for child workers in non-coffee households (Figure 16 and 17).[30] In addition, households residing in the high coffee intensity region were significantly more likely to increase child labor (Table 21). Consistent with these trends, school attendance decreased among children in coffee households while it increased for non-coffee households (Figures 9, 10 and 18).

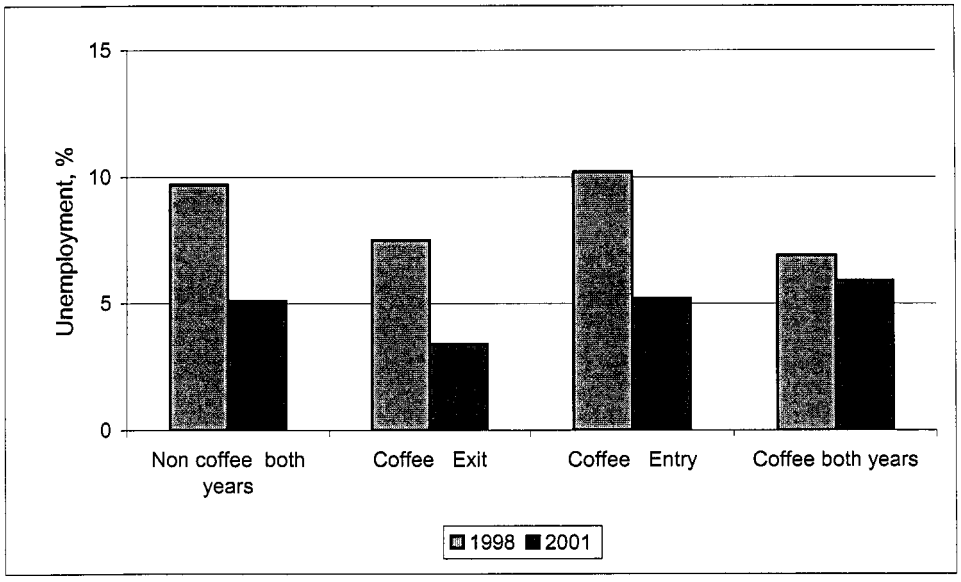
[30] The labor force participation among coffee households may be due to a shrinking demand for labor, corroborated by the higher unemployment rate among coffee households (Figure 15).

Figure 14: The coffee crisis and child labor: labor force participation (ages 6-14)



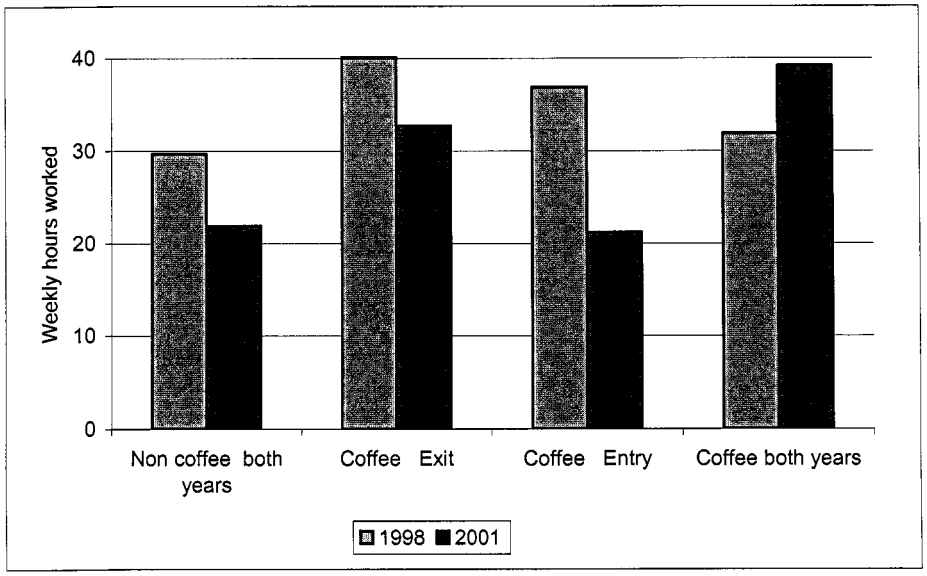
Sources: Nicaragua LSMS 1998 and 2001.

Figure 15: The coffee crisis and child labor: unemployment (ages 6-14)



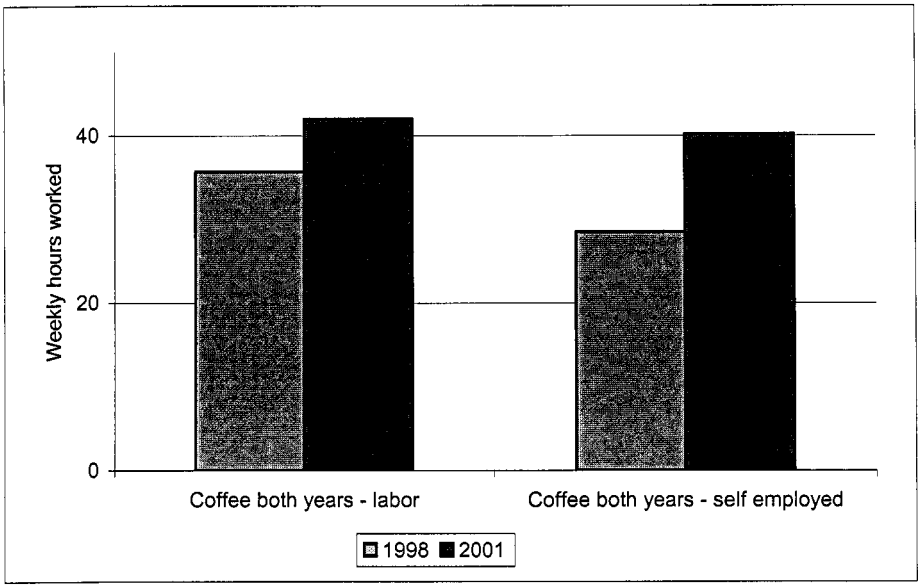
Sources: Nicaragua LSMS 1998 and 2001.

Figure 16: The coffee crisis and child labor: hours worked (ages 6-14)



Sources: Nicaragua LSMS 1998 and 2001.

Figure 17: The coffee crisis and child labor: hours worked (ages 6-14)

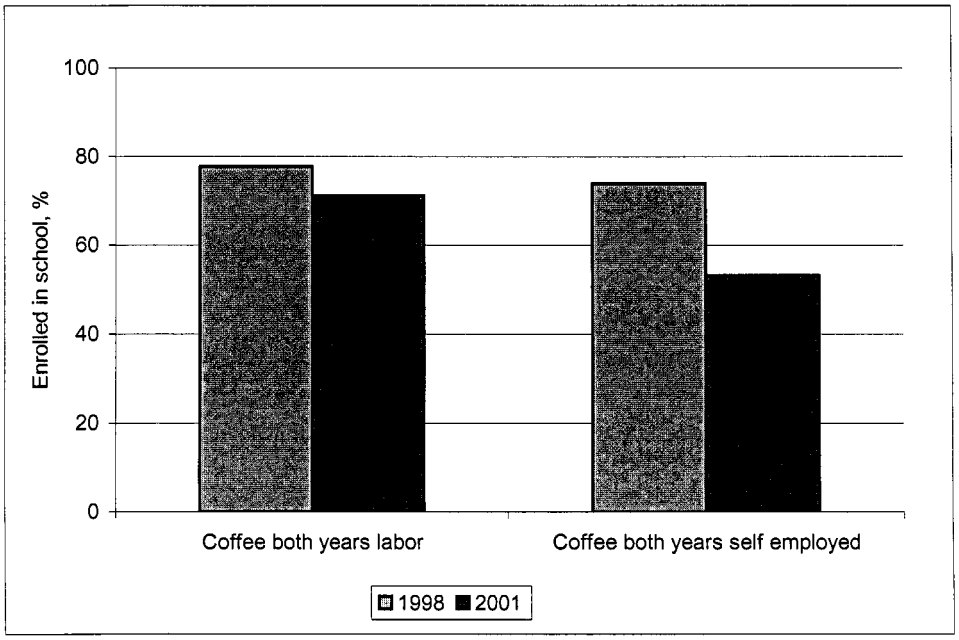


Sources: Nicaragua LSMS 1998 and 2001.

Table 21: Coping mechanisms, by initial coffee household definition

	Household experienced						
	Increases in child labor	Increases in adult labor	Migrating members	Decreases in school enrollment	Decreases in land owned	Decreases in cattle owned	Decreases in poultry owned
Coffee labor in 1998	-0.08	0.18	0.01	-0.07	-0.04	-0.04	-0.14
Coffee farmer in 1998	0.21**	0.02	-0.02	0.17**	0.25***	0.26***	0.21***
Poor in 1998	0.16***	0.10***	-0.01	0.05	0.06**	0.02	0.04
Coffee labor * Poor in 1998	0.10	-0.23**	-0.01	0.11	-0.13	-0.07	0.34**
Coffee farmer * Poor in 1998	-0.06	-0.16*	0.02	-0.06	-0.14**	-0.09**	0.01
Affected by Hurricane Mitch	-0.02	0.03	0.00	-0.01	-0.00	-0.04**	-0.03
Observations:	1355	1355	1355	1355	1355	1355	1355
Log likelihood:	-795	-863	-240	-788	-683	-521	-818
Adjusted percentage of correct prediction:	0.76	0.70	0.96	0.78	0.78	0.86	0.70

Figure 18: The coffee crisis and child labor: primary school enrolment (ages 6-14)



Sources: Nicaragua LSMS 1998 and 2001.

The use of child labor as a coping strategy was more prevalent among coffee farm households. In particular, even though children working in labor and farm households both worked more and went to school less, the impact in terms of increases in hours worked was stronger among coffee farm households (Figure 16 and 17). This is also confirmed by looking at the results in equation 4 that imply that coffee farm-households were up to 21 percent more likely than non-coffee households experience child-labor increases (Tables 20 and 21). These patterns raise serious issues about the need of policy interventions that can protect children's human capital against adverse shocks.

While partial evidence seems to suggest that remittances are important for consumption smoothing, migration per-se does not seem to be a widespread strategy adopted among coffee households. While the empirical results of equations 3 suggest that both coffee and non-coffee households receiving remittances in 1998 were more likely experience non-food consumption growth (Tables 13, 16 and 19), the results from the coping equation 4 imply that migration was not a coping strategy implemented by coffee households (Tables 20-23).[31]

[31] Nonetheless, migration as a coping strategy was suggested during various informal interviews in rural Nicaragua and it consistent with similar studies such as Beneke and Gonzalez-Vega (2000) who find that the existence of international migrants within a household was correlated with higher income growth during a downturn in agricultural production in El Salvador.

Table 20: Coping mechanisms, by initial coffee household definition

	Household experienced						
	Increases in child labor	Increases in adult labor	Migrating members	Decreases in school enrollment	Decreases in land owned	Decreases in cattle owned	Decreases in poultry owned
Coffee labor in 1998	0.03	-0.05	-0.01	0.02	-0.13***	-0.09**	0.11**
Coffee farmer in 1998	0.16***	-0.09*	-0.01	0.12***	0.10**	0.12***	0.22***
Affected by hurricane Mitch	-0.01	0.03	0.00	-0.00	-0.00	-0.04**	-0.03
Observations:	1355	1355	1355	1355	1355	1355	1355
Log likelihood:	-795	-863	-240	-788	-683	-521	-818
Adjusted percentage of correct prediction:	0.76	0.70	0.96	0.78	0.78	0.86	0.70

Table 22: Coping mechanisms, by regional coffee intensity definition

	Household experienced						
	Increases in child labor	Increases in adult labor	Migrating members	Decreases in school enrollment	Decreases in land owned	Decreases in cattle owned	Decreases in poultry owned
Medium coffee intensity region	0.02	-0.09***	-0.01	-0.06*	-0.01	-0.02	0.02
High coffee intensity region	0.06*	-0.07**	-0.01	-0.02	-0.00	-0.02	0.11***
Affected by Hurricane Mitch	-0.01	0.03	0.00	-0.00	-0.01	-0.04**	-0.03
Observations:	1355	1355	1355	1355	1355	1355	1355
Log likelihood:	-795	-863	-240	-788	-683	-521	-818
Adjusted percentage of correct prediction:	0.76	0.70	0.96	0.78	0.78	0.86	0.70

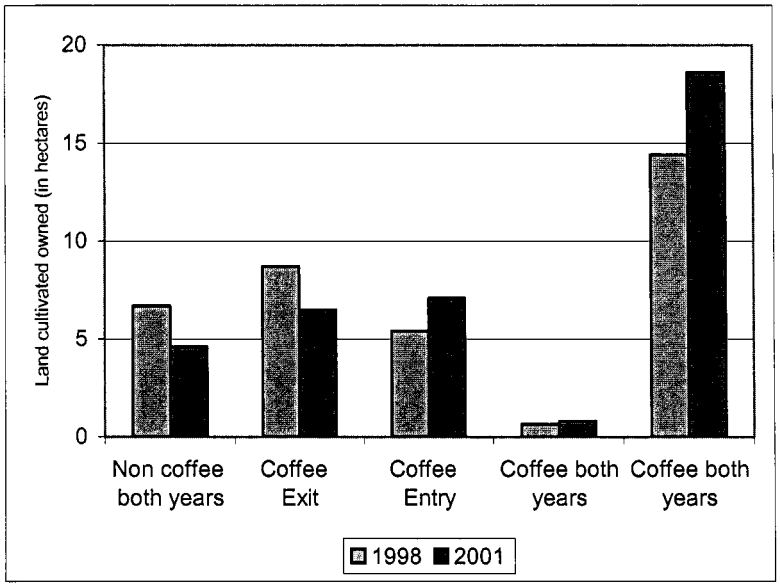
Table 23: Coping mechanisms, by regional coffee intensity definition

	Household experienced						
	Increases in child labor	Increases in adult labor	Migrating members	Decreases in school enrollment	Decreases in land owned	Decreases in cattle owned	Decreases in poultry owned
Medium coffee intensity region	-0.01	0.01	-0.04	0.01	-0.10**	-0.11***	-0.07
High coffee intensity region	0.08	0.10	0.03	-0.00	0.04	-0.01	-0.03
Poor in 1998 (=1)	0.15***	0.15***	-0.00	0.07**	0.01	-0.03	-0.02
Medium coffee intensity region * Poor in 1998	0.07	-0.14**	0.07	-0.10*	0.16**	0.22***	0.16**
High coffee intensity region * Poor in 1998	-0.05	-0.21***	-0.03	-0.02	-0.05	-0.01	0.18**
Affected by Hurricane Mitch	-0.02	0.04	0.00	-0.00	-0.01	-0.04**	-0.04
Observations:	1355	1355	1355	1355	1355	1355	1355
Log likelihood:	-795	-863	-240	-788	-683	-521	-818
Adjusted percentage of correct prediction:	0.76	0.70	0.96	0.78	0.78	0.86	0.70

4.4 *Precautionary savings*

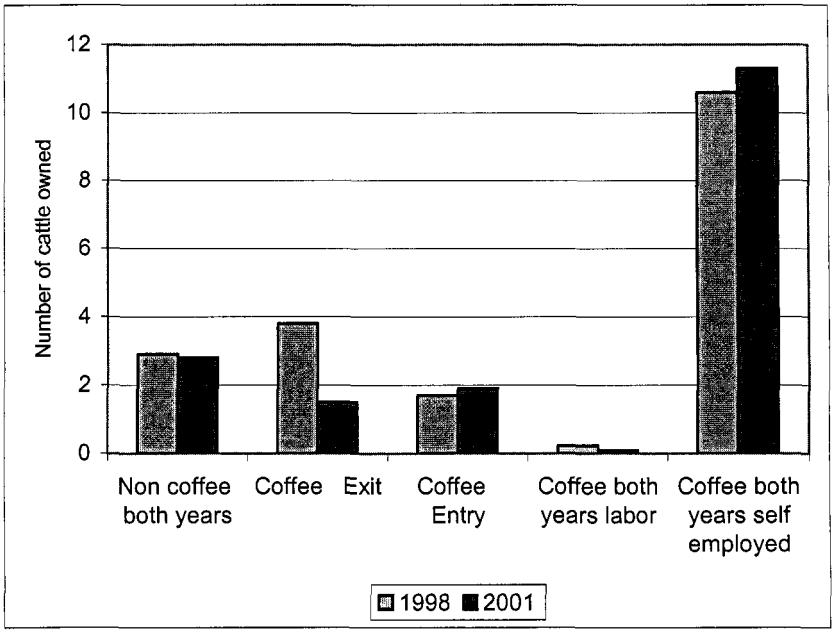
In addition to adjustments to income portfolios, precautionary savings can help households cope with shocks allowing them to liquidate available assets. Still, coffee labor households were the most asset-poor among all households in rural Nicaragua. As such, their ability to use such assets to cope with shocks was limited. By contrast, coffee farmers during 1998 were among the wealthier households in terms of asset holdings. Exploring the changes of various assets like land or livestock indicates that some of these assets were used as coping mechanisms, still in a limited way (Figures 19-22).

Figure 19: The coffee crisis and assets: land



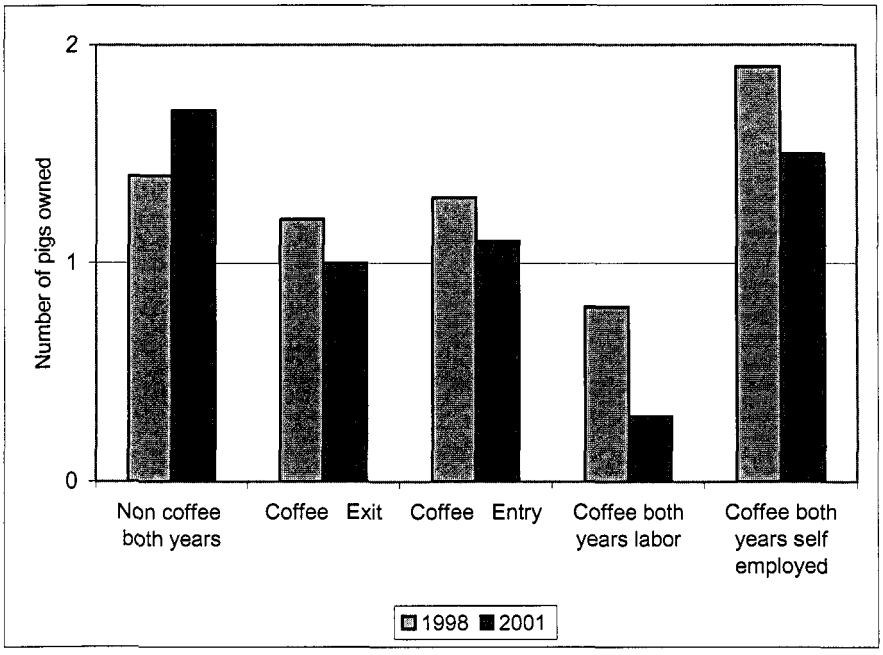
Sources: Nicaragua LSMS 1998 and 2001.

Figure 20: The coffee crisis and assets: cattle



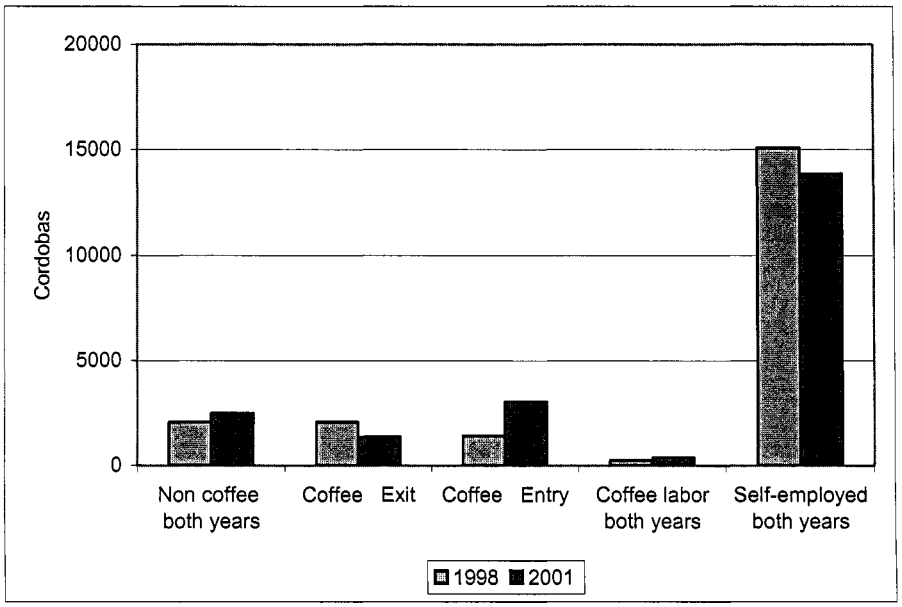
Sources: Nicaragua LSMS 1998 and 2001.

Figure 21: The coffee crisis and assets: pigs



Sources: Nicaragua LSMS 1998 and 2001.

Figure 22: The coffee crisis and assets: value of equipment



Sources: Nicaragua LSMS 1998 and 2001.

Furthermore, equation 4 suggests that poor farmers were less likely to use assets in response to the coffee shock. By differentiating between coffee poor and non-poor households based on their 1998 classifications, the results suggest that poor coffee farmers were 13 percent less likely to sell land and 9 percent less likely to sell (or consume) cattle compared to non-poor coffee farm households (Table 21). Interestingly, poor coffee households were more likely to experience decreases in the number of poultry owned, suggesting partial coping via own animal consumption (Tables 20, 21 and Figure 21). These trends overall indicate the importance of assets and highlight the limited capacity among poorer households to use physical assets as a major coping strategy.[32]

4.5 *Informal insurance*

The use of informal insurance mechanisms can be another instrument by which household may use to address shocks. For example, informal social networks established by households through memberships in civic, religious, or neighborhood organizations can provide them an alternative source of resources in the event of an adverse shock. In addition, strong ties with migrant household members of relatives may result help in the form of remittances or informal gifts during crises.

The empirical analysis shows that at least partially, the role of family networks is important. As discussed earlier, remittances (used as a proxy for the existence of a family network) were positively correlated with non-food consumption growth for both coffee labor and labor households (Table 16). The impact seems to be stronger for coffee labor households implying that informal coping mechanisms may be more important for the poorer coffee households.

[32] This finding is similar to results in Conning, Olinto and Trigueros (2000) who find that households owning land or other productive assets were better able to protect their income during economic downturns.

4.6 *Exiting coffee*

As indicated earlier, a significant number of households in the survey exited the coffee sector during this period. This "exit option" was higher among coffee laborers partially explained by the short run inability of coffee farmers to exit the coffee sector due to their land commitment to the coffee production (Table 24). The observation that households that exited coffee did overall better in terms of (socio)-economic outcomes suggests that that it would be useful to explore the attributes of those exiting in order to understand the characteristics associated with higher mobility to get out of coffee. While the data does not permit the distinction between those households that exited coffee due to lack of jobs or farm business failure with those that have used exit as a risk management strategy, a model exploring a number of initial (1998) characteristics and how they correlate with the exit decision of the following is estimated as follows:

$$\text{Prob}(ExitCoffee_{i,2001} \mid Coffee_{i,1998} = 1) = \lambda_0 \cdot W_i + \lambda_1 \cdot Coffee_k \beta + \lambda_2 \cdot (W_i' \cdot Coffee_k) + \pi_i \quad (5)$$

where W is a vector of initial (1998) household and regional attributes and $Coffee_k$ is a dummy identifying coffee farmers capturing a differentiated impact of an attributing between coffee labor and farm households. As earlier, λ_0, λ_1 and λ_2 are parameters to be estimated while π_i is an i.i.d. error term. The estimation also uses municipality level fixed effects. Table 25 presents the results.

Table 24: Transition matrix between coffee and non-coffee work (in %)

		2001			
		COFFEE-LABOR	COFFEE-FARMER	NON-COFFEE	TOTAL
1998	COFFEE-LABOR	35	9	56	100
	COFFEE-FARMER	10	54	37	100
	NON-COFFEE	5	4	91	100

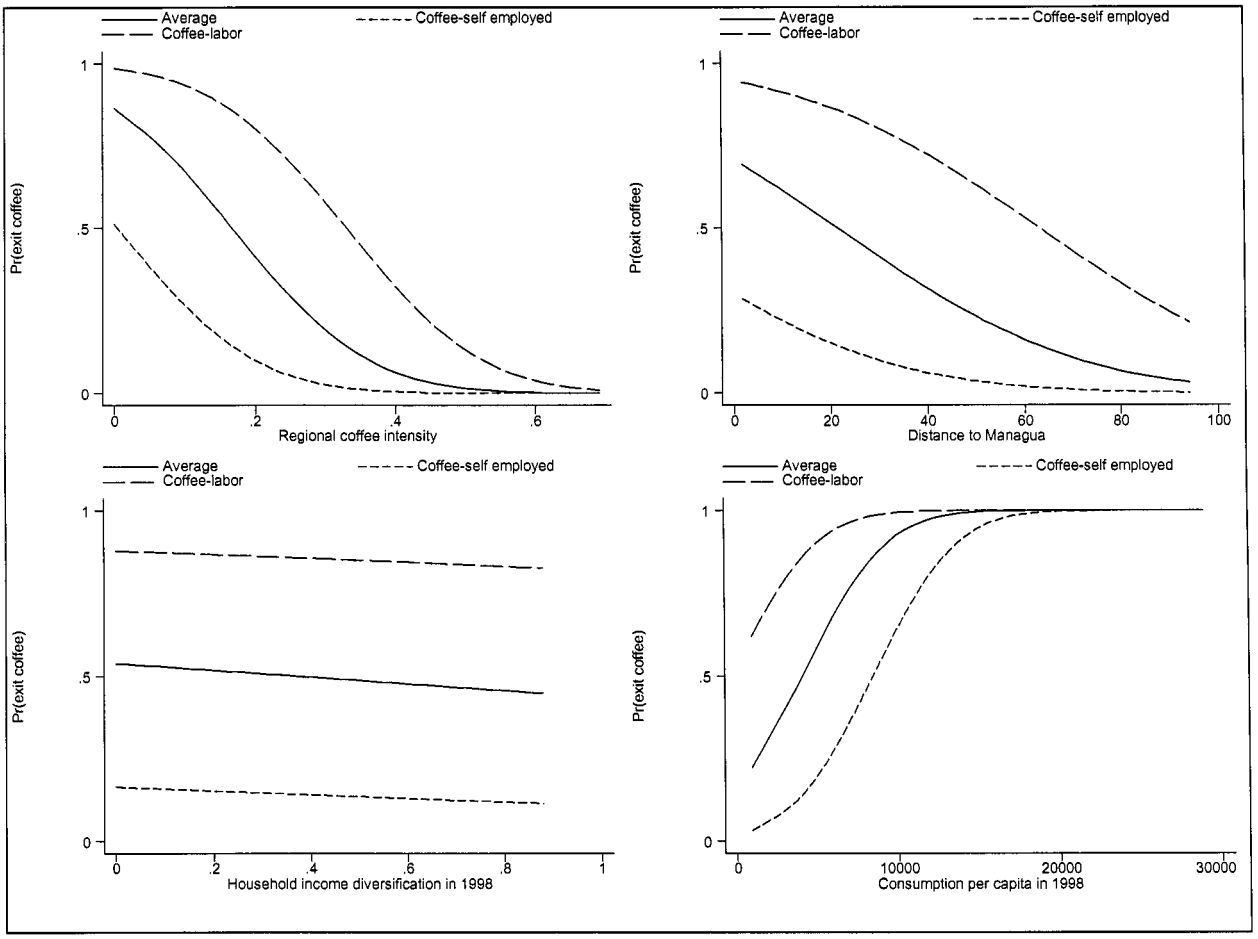
Assets, wealth status and income diversification in non-agricultural jobs are important correlates with a household's ability to exit coffee. Less poor households were more likely to exit coffee suggesting that poorer households are less mobile. In addition, conditional on whether a household is a coffee laborer or farmer, higher consumption increases the probability for coffee laborers to exit coffee compared to farm coffee households (see also Figure 25). Similarly, while farm households were less likely to exit (since by definition their land investment in the production process is fixed), after controlling for land size, larger farmers were more likely to exit the coffee sector, indicating that if land can be interpreted as wealth, assets are important in allowing households engage in new activities. Finally, coffee households that were more income diversified in non-agricultural activities were more likely to exit coffee. This is consistent with the earlier findings that show that the ability to enter the non-agricultural sector has been key in mitigating the negative shocks of the shock.

Table 25: Mobility out of coffee: who can exit?

	Model 1	Model 2	Model 3	Model 4
interacted with coffee farmer dummy	No	No	Yes	Yes
With fixed effects	No	Yes	No	Yes
Baseline period household characteristics (1998)				
Coffee farmer	-0.22***	-0.20*	-0.71*	-0.68
Number of adults aged 19-64	0.04	0.03	0.09*	0.03
Interaction			-0.05	0.06
Age of head of household	-0.003	-0.004	-0.01	-0.003
Interaction			0.003	-0.0002
Average years of education in households	-0.02	-0.02	-0.03	-0.06
Interaction			0.01	0.02
Cultivated land owned (in hectares)	0.0001	-0.002	-0.04**	-0.08*
Interaction			0.04**	0.09*
Received credit (yes=1)	0.10	0.12	0.43**	0.54**
Interaction			-0.39*	-0.49**
Income diversification index (0=not diversified)	0.27*	0.40*	-0.10	0.11
Interaction			0.78**	0.50
Annual per capita consumption (in cordobas x1000)	-0.01	0.01	0.01**	0.07*
Interaction			-0.12***	-0.1*
Affected by Hurricane Mitch (yes=1)	-0.14*	0.14	-0.33**	0.36
Interaction			0.35*	0.40
Coffee farm intensity (% of total cultivable land)	-1.43***		-2.62***	
Interaction			1.76**	1.33
Distance to Managua (in 10 minute intervals)	-0.01**	-0.01	-0.01**	-0.04*
Interaction			0.01	0.01
Log likelihood:	-122	-85	-107	-75
Adjusted percentage of correct prediction:	0.39	0.33	0.50	0.44
Observations:	216	151	216	151

Dependent variable: Coffee activity status in 2001 conditional on being in coffee in 1998.
Marginal effects reported
* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 25: Mobility out of coffee



Access to credit is associated with a higher probability to exit coffee. The role of credit can be crucial in mitigating the impact for shocks by both helping to cope and diversify in other activities. Credit has a stronger impact on the probability to exit coffee among labor coffee households as opposed to farmers, perhaps highlighting the lack of assets among coffee labor households.

Finally, a number of attributes describing the local economic context are correlated with exiting coffee. For example, distance to Managua or residing within the coffee region are both negatively correlated with the probability to exit coffee. Both of these attributes capture the existence of non-coffee activities and opportunities (in addition to controlling for the shock for the latter). Interestingly, residing in a region affected by hurricane Mitch also decreases the probability of exiting the coffee sector, presenting an example of the adverse effect of multiple shocks on households.[33]

While separating the decision to exit from a forced exit is challenging, these findings seem to indicate the critical importance of assets and opportunities on upward mobility and coping capacity. They reinforce the fact that in the presence of shocks, those households that can protect themselves using instruments that either detach them from exposure to risk or minimize its impact if the risk is realized, are better able to cope.

4.7 *The role of ex-ante risk management*

To summarize the results in this section, coffee households have used a mixture of coping mechanisms in response to the coffee crisis. While harmful coping mechanisms such as increases in child labor and - to a lesser extent - selling or consuming physical and animal assets were utilized among coffee households, a number of ex-ante management instruments such as exiting coffee, receiving remittances or income diversification were also used (Table 26).

Table 26: Use of risk management mechanisms and rural heterogeneity, by coffee definitions

		Type of strategy	Non coffee	Coffee labor	Coffee farmer
Labor market adjustments	Income diversification	ex-ante	Yes		
	Child labor	ex-post		Yes	Yes
	Ex-post migration	ex-post			
	Exit coffee	ex-ante/ ex-post		Yes	Yes
Precautionary savings	Sale of physical assets	ex-post			Yes
	Consumption of owned animals	ex-post		Yes	Yes
Informal insurance	Remittances	ex-ante	Yes	Yes	Yes

While a formal test cannot explicitly compare the two, the findings suggest that households that used ex-ante as opposed to ex-post mechanisms were better insulated from the coffee shock. For example, since much of the explanatory variables in the consumption growth models are all based on the initial pre-crisis household income strategies, their positive role on consumption growth can be interpreted as the realization of ex-ante risk management actions taken by these households. For example, by diversifying the income sources or having migrant members before the coffee shock, coffee households were better able to mitigate the adverse impact of the crisis. Similarly, higher education (using the maximum level of education in the household in 1998) was associated with a

[33] Hurricane Mitch hit the region in October 1998, right after collection of the first survey.

four percent increase in consumption growth, which -while not testable - is consistent with the hypothesis that human capital may have allowed households to mitigate the negative impact from the crisis by either finding higher return occupations or increasing farm efficiency. Comparing the effectiveness of ex-ante and ex-post strategies is beyond the scope of this study. Still, the dominant role of ex-ante strategies among coffee households for consumption smoothing and the observation that households that predominantly used ex-post coping mechanisms did worse suggests that, at least qualitatively, ex-ante strategies have been more effective.

5. SHOCKS, VULNERABILITY AND MOBILITY

The previous sections outlined the extent by which the coffee crisis has affected rural households and explored the various mechanisms affected households utilized to cope with the shock. While households do not seem to be able to fully insure against unanticipated income fluctuations, a number of coping strategies were used among rural coffee households that mitigated the impact of the coffee shock. For households affected by the coffee crisis, a heterogeneous set of mechanisms such as ex-ante income diversification or ex-post increases in child labor have allowed households to deal partially with the shock.

Nonetheless, prioritizing among the identified strategies and mechanisms explored above is a complex task. For example, the results suggest that the coffee shock had a bigger impact on farmers rather than labor households. Still, coffee farmers had the lowest poverty rates, highest level of assets while labor households are chronically poor. As such, further exploring the linkages between shocks and poverty dynamics may allow building a more comprehensive policy agenda.

5.1 Poverty dynamics

To this end, this section provides an analysis on the impact of shocks on poverty dynamics. Specifically, two questions are addressed: (i) has the coffee shock increased household vulnerability to decreases in welfare; and (ii) did the ability of households to escape poverty (mobility) changed due to the shock?

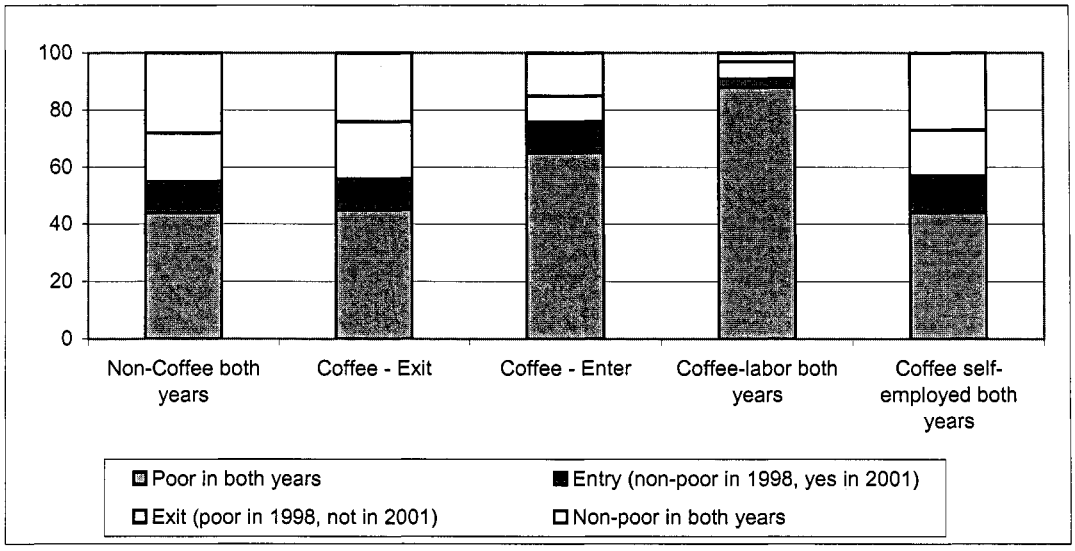
In the case of rural Nicaragua, poverty is dynamic. For example, between 1998 and 2001, almost a third of non-coffee households moved in and out of poverty (Table 27, Figures 23 and 24). In addition, non-coffee households were less likely to exit poverty (upward mobility) than falling into poverty, consistent with the overall poverty rate decreases observed during this period.

Table 27: Rural poverty dynamics, by coffee definitions (% of households)

		Poverty in 2001		
		Poor	Non Poor	Total
Poverty in 1998	Non-Coffee			
	Poor	46	19	65
	Non Poor	9	26	35
	Total	55	45	100
	Exit			
	Poor	67	11	78
	Non Poor	9	13	22
	Total	76	24	100
	Enter			
	Poor	52	24	76
	Non Poor	11	14	24
	Total	63	37	100
	Both years-Labor			
	Poor	90	5	95
	Non Poor	2	3	5
	Total	92	8	100
	Both years- farmer			
	Poor	51	10	61
	Non Poor	17	23	39
	Total	67	33	100

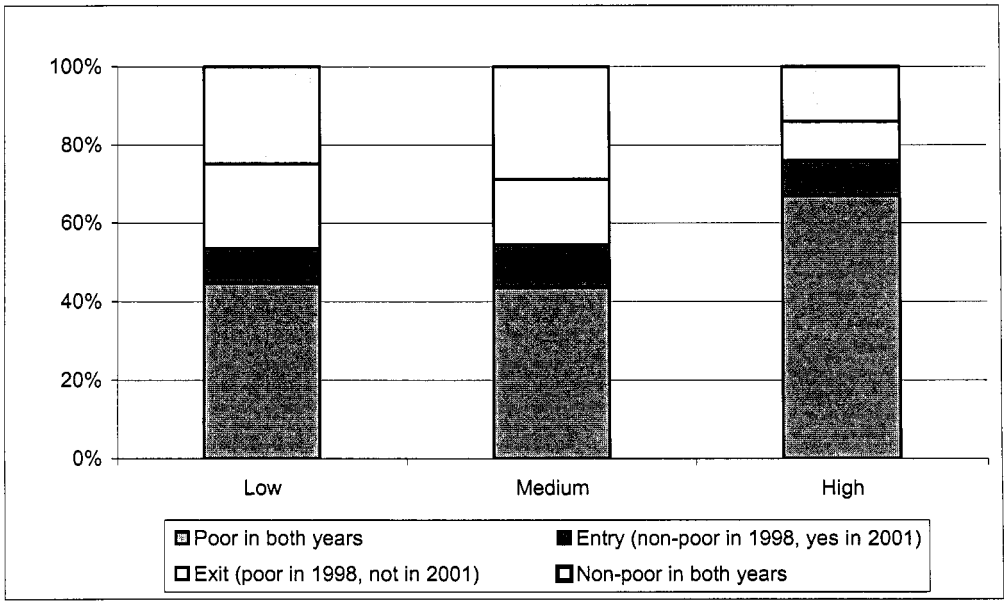
Sources: Nicaragua LSMS 1998 and 2001.

Figure 23: Poverty mobility by household coffee definition



Sources: Nicaragua LSMS 1998 and 2001.

Figure 24: Poverty mobility by regional coffee definition



Sources: Nicaragua LSMS 1998 and 2001 and National Agricultural Census 2001.

In addition, a number of interesting patterns related to the coffee shock emerge with respect to poverty changes. First, while almost a third of coffee farm households experienced similar movements in and out of poverty compared with the overall trends above, they were more likely to enter poverty (Table 27). In addition, coffee labor households were virtually trapped in chronic poverty. Almost 90 percent of coffee labor households remained in poverty and experience little upward mobility.

Coffee households were also more likely to experience a consumption decrease. Only ten percent of non-coffee experienced a fall in their "ranking" in terms of consumption quintiles (Table 28). This compares with a quarter of coffee labor households and half of the coffee farmers. In addition, comparing households based on whether consumption in general decreased over the period, while almost 40 percent of non-coffee household experienced consumption decreases, more than two thirds of coffee farm households and 56 percent among coffee labor households suffered a drop in consumption.

Table 28: Consumption decreases, by coffee definitions (% of households)

	% of households experiencing a consumption decrease:	
	Level	Quintile
Coffee typology		
Non coffee both years	38	11
Exit coffee	46	27
Enter coffee	48	30
Coffee both years	61	39
Coffee farmers both years	56	47
Coffee labor both years	65	23
Regional coffee definition		
Low	36	15
Medium	43	8
High	52	25

Sources: Nicaragua LSMS 1998 and 2001.

These results indicate that the coffee shock may have affected coffee households' ability to enter or exit poverty. Further exploring how the coffee shock may have affected these dynamics is addressed below.

5.2 Vulnerability to poverty

Vulnerability is a dynamic concept capturing the probability that a household will experience a negative loss in its welfare.[34] The main idea of vulnerability is that it measures a household's ability to insure or protect against exposure to risk. In fact, while exposure per se is not sufficient to infer vulnerability, observing a differential behavior among exposed households or between exposed and non-exposed households is indicative of the degree that a household will suffer welfare losses in the event of the risk being realized, therefore measuring its vulnerability to risk exposure.

For the purposes of the study, three definitions for vulnerability are used: (i) the likelihood that a household's consumption fell below the poverty line during the two periods covered by the data; (ii) the probability that a household's experienced a decrease in its consumption level; and (iii) the probability that a household's initial ranking based on consumption quintiles decreased. To address the first definition, the following model of the probability that a household - which was *not* poor in 1998 - entered poverty in 2001 is estimated:

$$\text{Prob}(C_{i,2001} < PovLine_{2001} \mid Poor_{1998} = 0) = \sum_{k=1}^{N-1} \varsigma_k \cdot Coffee_k + \rho \cdot X_i +_i \psi \cdot Z + \tau_i \qquad (6)$$

where $Coffee_k$, X_i and Z_i are as defined earlier, τ_i is an i.i.d. error term. In addition, while ς_k tests whether a household's exposure to the coffee crisis increase the probability (and therefore vulnerability) to fall into poverty, ρ and ψ reveal the extent where a number of household attributes are correlated with vulnerability to poverty.[35]

[34] Holzmann 2001.

[35] To control for municipal-level characteristics related to the coffee crisis, the regression also includes the municipality-level intensity in coffee production.

Similarly, using the second definition, the probability that household *i* experienced a fall in consumption level is given by:

$$\text{Prob}(C_{i,2001} < C_{i,1998}) = \sum_{k=1}^{N-1} \varsigma_k \cdot Coffee_k + \rho \cdot X_i + \psi \cdot Z_i + \tau_i \quad (7)$$

while for the last definition, the probability that a household's consumption ranking fell can be estimated using:

$$\text{Prob}(Quintile_{i,2001} < Quintile_{i,1998}) = \sum_{k=1}^{N-1} \varsigma_k \cdot Coffee_k + \rho \cdot X_i + \psi \cdot Z_i + \tau_i \quad (8)$$

The results from these models are presented in Table 29.

Table 29: Poverty dynamics: examining vulnerability and mobility

	Probability to:			
		Experienced a fall in consumption		
	Fall into poverty	Level	Quintile	Exit poverty
Baseline period household characteristics (1998)				
Coffee labor	0.07	0.07	0.05	0.09
Coffee farm	-0.09	0.01	-0.00	0.14
Family size	0.01	0.01	0.01	-0.04***
Maximum years of education in household	-0.03***	-0.03***	-0.03***	0.03***
Number of kids workers	0.03	0.00	-0.01	-0.00
Number of adult workers	0.01	-0.02	0.00	0.03*
Number of income sources	-0.02	-0.01	-0.02	0.05**
Land owned (hectares)	-0.00	-0.00	-0.00	0.00***
Received remittances (yes=1)	-0.03	-0.03	-0.01	0.06*
Distance to Managua (10 minute intervals)	0.00**	0.00	0.00	-0.00**
Coffee farm intensity in municipality	0.33	0.67***	0.43***	-0.78***
Affected by Mitch (yes=1)	0.03	0.07**	0.06**	-0.06**
Sample	Non-poor in 1998	All rural	All rural	Poor in 1998
Observations	505	1355	1355	850
Log likelihood:	-306	-936	-880	-481
Adjusted percentage of correct prediction:	0.72	0.59	0.65	0.77

Dependent Variable for model 1: Poverty status in 2001 conditional on being non poor in 1998.
Dependent Variable for model 2: Dummy on whether a household experienced a decrease in consumption level between 1998 and 2001.
Dependent Variable for model 3: Dummy on whether a household experienced a decrease in consumption quintile ranking between 1998 and 2001.
Dependent Variable for model 4: Poverty status in 2001 conditional on being poor in 1998.
Additional controls: initial period consumption quintile ranking for 2nd and 3rd models.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Households residing in the coffee region were more vulnerable to welfare losses, suggesting that the coffee shock increased vulnerability. While participation in the coffee sector (using the initial coffee classification) did not have statistically significant effect in household's vulnerability to welfare loss, the regional coffee definition suggest that households in the coffee region were more likely to experience a fall in consumption (Table 29). This finding implies that exposure to the coffee shock risk has increased vulnerability to welfare losses among exposed households.

Exploring further the concept of vulnerability to poverty and consumption loss, a number of interesting points arise. For example, higher levels of education significantly reduce vulnerability to poverty. This reinforces the importance of human capital accumulation as an ex-ante instrument to minimizing vulnerability. In addition, residing in a municipality affected by hurricane Mitch increases the probability that a household will experience reductions in welfare. Again, this confirms the hypothesis that shocks negatively influence poverty dynamics, in this case vulnerability.

5.3 Upward mobility

An alternative exercise in understanding poverty dynamics is to explore the factors that are correlated with households' mobility to exit poverty. To address this, a model of the probability that a household exited poverty in 2001 conditional on being poor in 1998 is estimated:

$$\text{Prob}(C_{i,2001} > PovLine_{2001} \mid Poor_{1998} = 1) = \sum_{k=1}^{N-1} \varsigma_k \cdot Coffee_k + \rho \cdot X_i + {}_i \psi \cdot Z + \tau_i \quad (8)$$

where the regressors are the same as in equation 6 and 7. The results are discussed below.

Households residing within coffee regions were less likely to exit poverty. Mirroring the results on vulnerability, while the household-level classifications of affiliation in coffee activities were not significant, this finding illustrates the aggregate impact of the exposure to the coffee crisis in upward mobility (Table 29).

A number of other factors are correlated with the ability to exit poverty. First, income diversification increases the probability to exit poverty (Table 29). This provides empirical support to the current policy efforts to promote diversification in rural areas, as it indicates that it is not only a successful coping strategy (among coffee farmers) but also important in enhancing upward income mobility.[36] It is also important to point out, however, that the diversification measure used here refers to income from different sources (agriculture, non-agriculture, wage and self-employment), and not to diversification in agricultural production. Indeed, an alternative specification using crop diversification found no significant correlation with poverty dynamics.

In addition, households receiving remittances were more likely to exit poverty. This result indicates that migration as a strategy to access higher-return opportunities, is important for economic mobility and reinforces the role of social capital and informal networks in poverty alleviation. Furthermore, both human capital (education) and physical (land) assets were also positively correlated with exiting poverty. Finally, distance from Managua is inversely related to the ability to exit poverty. To the extent that this captures the local economic environment, it shows that more isolated areas offer fewer income options for households.

[36] Ministerio Agropecuario y Forestal (2003), Varangis et. al (2003).

To summarize the poverty dynamics analysis vis-à-vis the coffee crisis, predicted probabilities to fall or escape poverty are calculated. First, households affiliated with the coffee sector were the most vulnerable to decreases in welfare and least mobile to exit poverty compared to non-coffee households, suggesting that the coffee crisis has indeed affected their mobility and vulnerability (Table 30). These results are robust as they hold independent of the coffee definition or typology used.[37]

Table 30: Poverty dynamics: predicted probabilities, by coffee Household (% of households)

	Predicted probability to:			
		Experienced a fall in consumption:		
	Fall into poverty	Level	Quintile	Exit poverty
Household definition				
Non coffee both years	27	45	33	24
Exit coffee	32	52	39	27
Enter coffee	36	47	34	16
Coffee labor both years	44	55	40	17
Coffee farmer both years	30	61	47	17
Initial year classification				
Non coffee in 1998	27	45	34	23
Coffee-labor in 1998	39	52	38	19
Coffee-farm in 1998	29	59	45	23
Regional definition				
Low coffee intensity	27	43	32	27
Medium coffee intensity	26	46	35	23
High coffee intensity	33	56	41	14
Overall	28	47	35	22

Finally, while coffee laborers –the poorest rural group in the survey - were the most adversely affected with respect to vulnerability and mobility with respect to poverty, coffee farmers were mostly affected in terms of the probability to experience consumption declines. These results, suggest that while for coffee farmers the shock may have been more transitory in nature, it may have accentuated poverty traps among the chronically poor coffee laborers. This raises the need for distinct policy interventions for each of the two groups.

6. PUBLIC RESPONSE TO THE COFFEE CRISIS

While Government and private support for the coffee sector was significantly delayed in Nicaragua, a number of programs addressing the coffee crisis have since been established. A short summary is presented below.

[37] The probability to exit poverty among non-coffee households is not statistically significant with that of coffee-farm households using the initial coffee classification.

6.1 Debt restructuring

By 2002, coffee-farm debts totaled approximately US$105 million in Nicaragua.[38] As the ability of coffee farmers to repay these loans diminished, it presented a potential crisis in the country's already stressed financial system. As such, the Government intervened by promoting, coordinating and providing funds for different debt-restructuring programs.

These programs varied according to the type of debt held by a coffee producer, with the following main restructuring categories being created: (i) debts to solvent commercial banks (US$55 million – 684 cases); (ii) debts to bankrupt commercial banks (US$32 million – 665 cases); (iii) debts to micro-finance organizations (US$6 million – 7,520 cases); and (iv) debts to exporting firms (US$12 million – 2,300 cases). The first two categories targeted mainly medium and large coffee farmers (with farms sizes of at least 20 manzanas), the third focused on small farmers (5 manzanas or less) while the final category did not distinguish based on farm size. It is important to note that the majority of the government restructuring schemes (more than 80 percent) has focused on large coffee farmers.

As of May 2003, 100% of the debts in categories (i) and (iii) had been resolved, where the Government played an active role. While the Government did not get involved in re-structuring producers' debts to exporting firms (category iv), these appear to be getting resolved in an efficient manner by the stakeholders (usually an exporting firm and a producer).

6.2 Social protection interventions

The Government of Nicaragua implemented a "Food-for-work on Coffee Farms" program through the Ministry of Agriculture (MAGFOR). The program took place in 2002 in 21 coffee municipalities, costing US$574,336 and providing family food rations to 8,212 households: 6,317 of them were small coffee farm owners (6 *manzanas* or less), and 1,895 were coffee farm workers. Participating households received the food complement in exchange for working on various activities on coffee farms.[39]

6.3 Indirect benefits from existing (non-coffee specific) programs

A number of existing public programs may have indirectly mitigated the impact of the coffee crisis. First, the Government's "Libra por Libra" program which started in 2002 has led to higher productivity of small farmers' production of basic grains for own-consumption via the disbursement of genetically improved and certified seeds for basic grain production, and technical assistance. An estimated 72,000 small farmers, many of which reside in coffee regions have participated in the program. During 2003, and in part due to the coffee crisis, MAGFOR doubled the amount of seed distributed in some coffee regions.[40]

In addition, the "Red de Proteccion Social", a conditional cash program in Central Nicaragua that supplements poor rural households' incomes seems to have mitigated the adverse impact of

[38] Nicaraguan Coordination and Strategy Secretariat of the Presidency (SECEP).
[39] Prior to this program, the Government financed a small scale workfare program benefiting 300 coffee workers (representing about 1,000 family members) in 2001.
[40] MAGFOR.

the coffee shock. In particular, a recent impact evaluation of the program finds that program beneficiary households involved in the coffee sector have faired better in a number of socio-economic outcomes compared to non-participating coffee households.[41]

6.4 Support from other agencies

USAID financed a US$2.5 million coffee relief, food-for-work initiative in 2002. The program's objectives was to provide relief to unemployed coffee laborers, provide incentive to coffee farmers to continue employing their full-time labor force on a full-time basis, ensure that essential crop maintenance is performed and provide limited support to rehabilitate public infrastructure. An estimated 13,394 coffee laborers in ten coffee municipalities benefited from the USAID program.

Finally, the German government's assistance agency (KDR) financed a large infrastructure project to increase the supply of potable drinking water in the departments of Jinotega and Matagalpa. This project was initiated in 2001, and it generated approximately 10,000 to 15,000 temporary jobs, potentially coffee laborers.

While the programs described above may have temporarily alleviated some of the adverse impacts of the coffee crisis, it is unclear as to whether they have fully addressed its structural nature. In fact, none of the coffee-specific programs discussed above seem to have had a long-term objective but instead aimed at addressing the short run coping capacity of affected households. In addition, the majority of the public resources were targeted in a regressive way, mainly directed to medium and large coffee farmers.

7. MOVING FORWARD: LESSONS FOR CONSTRUCTING A POLICY AGENDA

Using household level panel data from Nicaragua, this paper explores the impact of the recent coffee crisis on rural households engaged in coffee production and coffee labor work. Taking advantage of the panel structure of the data, a number of findings emerge: (i) while overall growth between 1998 and 2001 was widespread in rural Nicaragua, coffee households saw large declines in various socioeconomic outcomes; (ii) small coffee-farm households were affected the most, and not poor labor households as previously expected; (iii) among the various risk management strategies coffee households used to address the shock, pre-shock, ex-ante strategies (like income diversification) were more effective in allowing coffee households insulate against the shock. By contrast, the coffee households that used ex-post coping instruments did not manage to mitigate the adverse impact as well, with additional potential long run implications via extensive uses of harmful coping strategies (like increases in child labor); and (iv) the coffee shock affected upward mobility and downward poverty vulnerability.

Based on the finding above, a number of lessons emerge in terms of pushing forward the policy agenda related to the coffee crisis and shocks in general. They are discussed below.

7.1 "Understand the shock and those affected"

Initial attention on the coffee crisis focused on the impact of the shock on labor employment. The analysis shows that it was small coffee farmers, rather than poor coffee laborers, that appear to have experienced the most serious effects from the crisis. This was partly due to the fact that while labor workers

[41] Maluccio (2003).

were mobile in moving from coffee employment to other low paying labor jobs, coffee farm households were stuck in long-term perennial investments with little flexibility to complement their incomes.

These insights have important implications about the choice of a short-run safety net one could potentially consider. While shocks that result in open unemployment are typically addressed through workfare programs by providing support to unemployed workers until renewed labor demand draws them back into the labor market, the fact the laborers were able to substitute for potential labor losses via alternative low paying job opportunities seems to imply that such interventions were not necessarily critical. By contrast, while the immediate debt relief efforts discussed above may have allowed large farmers to cope with falling coffee prices and cost increases, the low participation in such programs by small scale farmers and the lack of alternative coping mechanisms for them seems to explain to a large extent the large welfare impacts of the crisis on these small, immobile farm households. As such, understanding which populations shocks affect and how is key for designing appropriate interventions.

7.2 "While households use a diverse set of informal risk management instruments, they are only partially effective"

Coffee households used a multitude of risk management mechanisms to address the crisis. Some examples include informal support systems such as receiving remittances from family, income diversification to sales of assets (land or animals) or sending children to work. Nonetheless, the absence of formal insurance instruments available to these households implies that such self-insurance and risk management instruments are unlikely to be fully effective in protecting them from risk exposure. Indeed, the results indicate that coffee households, especially the poorer coffee-labor ones, were extremely vulnerable to insuring food consumption, with more than 43 percent of the income shock among coffee-labor households being passed through food consumption decreases (and 13 percent among coffee-farm households). Such findings reinforce the need for improving formal insurance mechanisms and enhancing informal risk management instruments. They also suggest that interventions should pay special attention on the poorer and more vulnerable populations.

7.3 "Enhancing households' ex-ante set of risk management instrument base is crucial"

The findings suggest that households that used ex-ante as opposed to ex-post mechanisms were better insulated from the coffee shock. For example, coffee household that diversified their incomes, invested in human capital or exited the coffee sector altogether before the crisis hit (and thus fully dissociated themselves from the coffee risk exposure) were better positioned to deal with the coffee crisis. By contrast, coffee households that did not have the ability or did not use such risk management instruments were not only affected worse, but they also used some coping mechanisms with potential long-term adverse implications (such as taking children out of school). Policies that enhance the ability and adoption of ex-ante risk management strategies should therefore be at the center of the policy agenda.

7.4 "Shocks influence long run welfare dynamics"

Coffee households were the most vulnerable to fall into poverty and the least mobile to exit poverty by taking advantage of the overall growth in rural Nicaragua over the period of the study. Still, while coffee farmers were affected the most in terms of levels, even after the crisis hit they were still among the wealthiest rural groups in Nicaragua. By sharp contrast, coffee laborers – by far the poorest rural group in the survey - were the most adversely affected with respect to their increased probability to fall and lower probability to exit poverty. These insights seem to indicate the

distinction between the impact of shocks with respect to chronic and transient poverty. To some extent, while for coffee farmers the shock may have been more transitory in nature, it may have accentuated poverty traps among the chronically poor coffee laborers. This raises the need for distinct policy interventions for each of the two groups better addressing structural versus transient poverty. Some potential areas for further exploration on this comes out of the analysis by observing the various factors that are correlated with the ability to fall or exit poverty. Such factors include the role of human capital and its importance as an ex-ante instrument to minimizing vulnerability and enhance upward mobility, the ability to have a diverse income portfolio by including non-agriculture income sources or the role of the local context and infrastructure in providing alternative income opportunities to risk exposed households.

7.5 "Long-run investments for short-run protection?"

While not a direct outcome from the study, some of the insights seem to suggest that longer-term interventions such as cash transfers conditional on household investments in household members' (such as children) health and education can partially allow households affected by shocks to better cope with shocks by insulating them from their adverse impacts. Indeed, "Red de Protection Social" beneficiary households involved in the coffee sector seem to have faired better in a number of socio-economic outcomes compared to non-participating coffee households (such as the significant higher children's education attainment outcomes among beneficiary households).[42]

Such programs are not designed to deal with shocks and are not "insurance" schemes per se. Still, the observed positive impact in the coffee crisis example suggests that by incorporating risk exposure in the design of such programs' eligibility rules, or by allowing additional flexibility in terms of scaling up or down such interventions to address large shocks on-demand is worth further examination to understand whether these programs can serve as alternative risk management instruments.

7.6 "Agricultural interventions: structural shocks require structural changes"

While this is beyond the scope of the paper, a number of insights with respect to the potential role of agricultural or coffee-industry specific interventions can be outlined. First, improving crop insurance schemes seems to be an important direction for further analysis. Introduction of such a market based ex-ante instrument can greatly improve households' ability to make decisions under uncertainty. This issue still remains highly understudied. Second, promoting product differentiation in coffee is another area for policy discussion. In fact, the fact that only ten percent of the current coffee production in Nicaragua is specialized (e.g. organic, fair trade) suggests that at least exploring its feasibility and pre-requisites of scaling up such practices is crucial.[43] In addition, enhancing marketing practices and channels by promoting local and external demand also seem important areas for policy design and intervention. Finally, as the analysis shows, facilitating coffee households to exit the coffee sector altogether may be a desired policy. To the extent that such as policy can be targeted at small farmers that engage in lower quality coffees or farm in marginal lands, complemented by promoting alternative livelihoods for such households seems to be a direction by which policy can strengthen household adaptability and mobility. Such structural changes can only be part of large comprehensive vision for rural development, poverty reduction and risk management schemes and as such, adapting these to the specifics parameters of regional and household realities will be essential.

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[42] Maluccio (2003).
[43] Varangis (2003).

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Appendix 2: Attrition and panel construction

An extensive analysis of the attrition in the Nicaragua panel used in this paper can be found in Davis and Stampini (2002). They conclude that while almost a third of the original sample was not interviewed in 2001, attrition is not a major problem in the sample. In fact, the only exception in their analysis is among urban non-poor households, where they find some weak evidence of non-random attrition. In addition, there does not seem to be a systematic difference between coffee households (both labor and farm) with non-coffee households (Table 31). As such, and since this paper focuses exclusively on rural households, attrition is not considered to be a problem.

Table 31: Panel attrition

	Non coffee Households		Coffee Households						All	
			Labor		Farmer		All coffee			
	Number	%	Number	%	Number	%	Number	%	Number	%
Dropped in 2001	1109	**28.8**	61	**30.5**	46	**28.1**	107	**29.4**	1216	**28.9**
In Panel	2736	71.2	139	69.5	118	71.9	257	70.6	2993	71.1
Total	3845	100	200	100	164	100	364	100	4209	100

COPING WITH THE COFFEE CRISIS IN CENTRAL AMERICA: THE ROLE OF THE NICARAGUAN SOCIAL SAFETY NET PROGRAM

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ABSTRACT

The international and local Nicaraguan media have widely reported on the "coffee crisis" in Latin America and there is substantial evidence that there has been a downturn and that this has been more severe in the coffee growing regions. Using household panel data from a randomized community-based intervention carried out in both coffee and non-coffee growing areas, I examine the role of a conditional cash transfer program, the *Red de Protección Social* (RPS) during this downturn. While not designed as a traditional safety net program in the sense of reacting or adjusting to crises or shocks, RPS has performed like one, with larger estimated program effects for those who were more affected by the downturn. For example, it protected households against declines in per capita expenditures and, while not significantly depressing labor supply relative to before the program, muted additional labor effort for beneficiaries in coffee growing areas, relative to their counterparts without the program. The evidence is more mixed, however, as to whether RPS enabled households to reallocate their resources in a fashion consistent with the historical downward trends in coffee prices. Beneficiaries who participated in the coffee industry as laborers were more likely to have exited the coffee industry, whereas those who participated as producers were less likely to have exited. The findings are consistent with the existence of credit constraints inhibiting such transitions in the absence of the program. Overall, then, RPS appears to be playing an important part in the "risk" coping strategies of households, a conclusion also supported by a separate analysis of individual household-level idiosyncratic shocks.

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1. INTRODUCTION

In spite of some recovery in 1994 and 1998, world coffee prices have been declining since the mid 1980s—in 2001, real prices were at their lowest levels in more than 50 years. The continued downward trend and the recent substantial decrease in prices have had adverse implications for incomes within many of the coffee producing countries in Central America. These have been widely reported on in the international and local media as the "coffee crisis." In some cases, prices have reached levels below typical production costs. Though only limited micro level empirical evidence exists regarding the magnitude and nature of the effects of the price trend, there is a perception that one consequence is that poverty is rising, at least among certain groups and in certain rural areas.

In this paper, I explore the effects of the price decline in some of the poorest rural regions of Nicaragua, using household-level panel data collected as part of a randomized evaluation of a conditional cash transfer program. I also examine the role played by the program, the *Red de Protección Social* (RPS), in protecting well-being, as well as its effects on labor market supply and activities. To do this, I contrast the behavior and outcomes of households who were benefiting from the program to those who were not. About half of these households live in coffee growing areas and many are involved to some extent in the coffee industry. These data are brought to bear on the following questions:

- How have households in coffee growing areas *without* the program fared over the period 2000–2002?

- Were households in coffee growing areas *with* the program better able to protect household expenditures (particularly on food) and educational and nutritional outcomes than their counterparts in coffee growing areas without the program? That is, how effective was RPS as a social safety net during the downturn?

- Were labor supply and the agricultural versus non-agricultural mix of activities within the household different among households in coffee growing areas with and without the program? That is, did RPS enable different labor responses to the downturn?

The overarching research question is whether, and how, the program enabled alternative responses to the downturn. While much of the emphasis in the paper is on the so-called coffee crisis, the results have broader implications to the extent they demonstrate how safety net programs like RPS condition behavior during an economic downturn.

The findings show that, while not designed as a traditional safety net program in the sense of reacting or adjusting to crises or shocks, RPS has performed like one, with larger estimated program effects for those who were more affected by the downturn. For example, it protected households against declines in per capita expenditures and, while not significantly depressing labor supply relative to before the program, muted additional labor effort for beneficiaries in coffee growing areas, relative to their counterparts without the program. The evidence is more mixed, however, as to whether RPS enabled households to reallocate their resources in a fashion consistent with the historical downward trends in coffee prices. The evidence is more mixed, however, as to whether RPS enabled households to reallocate their resources in a fashion consistent with the historical downward trends in coffee prices. Beneficiaries, who participated in the coffee industry, as laborers, were more likely to have exited the coffee industry, whereas those who participated as producers were less likely to have exited. The findings are consistent with the existence of credit constraints inhibiting such transitions

in the absence of the program. Overall, RPS appears to be playing an important part in the "risk" coping strategies of households, a conclusion also supported by a separate analysis of individual household-level idiosyncratic shocks.

2. DESIGN AND IMPLEMENTATION OF THE *RED DE PROTECCIÓN SOCIAL*[44]

In recent years, increasing emphasis has been placed on the importance of human capital in stimulating economic growth and social development. Consequently, investing in the human capital of the poor is widely seen as crucial to alleviating poverty, particularly in the long term. At the same time, there is growing recognition of the need for social safety nets to protect poorer households from poverty and its consequences during the push for economic growth (World Bank 1997). At first glance apparently conflicting strategies for economic development, both are important, and, potentially complementary (Morley and Coady 2003). Effective social safety nets may directly contribute to economic growth via improved human capital, particularly in the long term.

Consistent with this view, several Latin American countries have introduced programs that integrate investing in human capital with access to a social safety net. One of the first, and largest, programs of this type was the *Programa Nacional de Educación, Salud y Alimentación* (PROGRESA) in Mexico, begun in 1997. Another large program is the *Programa de Asignación Familiar* (PRAF) in Honduras. In this paper, I examine a third such program, the Nicaraguan *Red de Protección Social* (RPS) or "Social Safety Net." Modeled after PROGRESA, RPS is designed to address both current and future poverty via cash transfers targeted to households living in extreme poverty in rural Nicaragua. The transfers are conditional, and households are monitored to ensure that they are undertaking prescribed actions intended to improve their children's human capital development; when they fail to fulfill those obligations, they lose their eligibility for the program. By targeting the transfers to poor households, the program alleviates short-term poverty. By linking the transfers to investments in human capital, the program addresses long-run poverty. RPS's specific objectives include:

- Supplementing household income for up to three years to increase expenditures on food,
- Reducing school desertion during the first four years of primary school, and
- Increasing the healthcare and nutritional status of children under age five.

Designed in two phases over a period of five years starting in 2000, the pilot phase (also known as Phase I) was for three years with a budget of US $11 million funded by a loan from the Inter-American Development Bank (IDB), and represented approximately 0.2 percent of GDP or 2 percent of annual recurring government spending on health and education (World Bank 2001, annex 21). To permit an assessment of how a complex program like RPS has altered behavior of households during an economic downturn, it is first necessary to describe how the program operates and how it has evolved over time.

[44] Section 2 draws from Maluccio and Flores (2004) who provide a more complete description of the program.

2.1 Program Targeting

In the design phase of RPS, rural areas in all 17 departments of Nicaragua were eligible for the program. The focus on rural areas reflects the distribution of poverty in Nicaragua—of the 48 percent of Nicaraguans designated as poor in 1998, 75 percent resided in rural areas. For the pilot, the Government of Nicaragua (GON) selected the departments of Madriz and Matagalpa from the northern part of the Central Region of Nicaragua on the basis of poverty as well as on their capacity to implement the program. This region was the only one that showed worsening poverty between 1998 and 2001, a period during which both urban and rural poverty rates were declining nationally, and this downturn has been attributed in part to the decline in coffee prices (World Bank 2003). Approximately 80 percent of the rural population of Madriz and Matagalpa was poor, and half of those, extremely poor in 1998 (IFPRI 2002). Coffee is grown in many parts of Matagalpa, which lies at altitudes appropriate for its cultivation (above 800 meters). Both departments had easy physical access and communication (including being less than a one-day drive from the capital, Managua, where RPS is headquartered), relatively strong institutional capacity and local coordination, and reasonably good health post and school coverage. By purposively targeting, RPS could avoid devoting a disproportionate share of its resources during the pilot to increasing the supply of educational and health services.

In the next stage of geographic targeting, six (out of 20) municipalities were chosen based on criteria similar to those used at the department level.[45] The six were well targeted in terms of poverty. Between 36 and 61 percent of the rural population in each of the chosen municipalities was extremely poor and between 78 and 90 percent was extremely poor or poor (IFPRI 2002), compared with national averages of 21 and 45 percent, respectively (World Bank 2003). While not the poorest municipalities in the country, or in the chosen departments for that matter, the proportion of impoverished people living in these areas was still well above the national average.

In the last stage of geographic targeting, a marginality index based on information from the 1995 National Population and Housing Census was constructed and an index score was calculated for all 59 rural census "comarcas" (hereafter *comarcas*[46]) in the selected municipalities. The index was a weighted average of a set of poverty indicators (including family size, access to potable water, access to latrines, and illiteracy rates) in which higher index scores were associated with more impoverished areas (Arcia 1999).[47] The 42 *comarcas* with the highest scores were eligible for the pilot phase's first stage and were included in the evaluation.

2.2 Program Design

RPS has two core components:

Food security, health, and nutrition. Each eligible household receives a bimonthly cash transfer known as the *bono alimentario* or "food security transfer," contingent on attendance at bimonthly educational workshops and on bringing any children under age five for scheduled healthcare appointments. The workshops, held within the communities, educate mothers in household sanitation

[45] The six were Totogalpa and Yalagüina municipalities in the department of Madriz, and Terrabona, Esquipulas, El Tuma-La Dalia, and Ciudad Darío municipalities in the department of Matagalpa.

[46] Census comarcas are administrative areas within municipalities that include between one and five small communities averaging 100 households each.

[47] IFPRI (2002) describes the RPS targeting in more detail.

and hygiene, nutrition, reproductive health, breastfeeding, and related topics. To ensure adequate supply in these poor, rural communities, RPS trained (and paid) private providers to deliver the specific healthcare services required by the program—a child growth and monitoring program known as VPCD. These services, provided free of charge to beneficiary households, are directed toward children and also include vaccination and provision of anti-parasites, vitamins, and iron supplements.

Education: Each eligible household receives a bimonthly cash transfer known as the *bono escolar* or "school attendance transfer," contingent on enrollment and regular school attendance of children ages 7–13 who have not completed 4th grade of primary school. Additionally, for each eligible child, the household receives an annual cash transfer intended for school supplies (including uniforms and shoes) known as the *mochila escolar* or "school supplies transfer," and contingent on enrollment. Unlike the school attendance transfer, which is a fixed amount per household regardless of the number of children in school, the school supplies transfer is a per-child transfer. To provide incentives to the teachers, who have some additional reporting duties and were likely to have larger classes after the introduction of RPS, and to increase resources available to the schools, there is also a small cash transfer, known as the *bono a la oferta* or "teacher transfer."

Table 1 summarizes the eligibility requirements and demand and supply side benefits of RPS. Nearly all (about 95 percent) of the households were eligible for the food security transfer, and this cash transfer was a fixed amount per household, regardless of household size. Households with children ages 7–13 who had not yet completed the fourth grade of primary school were also eligible for the education component of the program.

Table 1: Nicaraguan RPS eligibility and benefits in the Pilot Phase

	PROGRAM COMPONENTS	
	Food Security, Health, and Nutrition	***Education***
ELIGIBILITY		
Geographic targeting	All households[a]	All households[a] with children ages 7–13 who have not yet completed fourth grade of primary school
DEMAND SIDE BENEFITS		
Monetary transfers	*Bono alimentario* *(food security transfer)* C$2,880 per household per year (US$224)	***Bono escolar*** ***(school attendance transfer)*** C$1,440 per household per year (US$112) ***Mochila escolar*** ***(school supplies transfer)*** C$275 per child beginning of school year (US$21)
SUPPLY SIDE **BENEFITS**		
Services provided and monetary transfers	Bimonthly health education workshops Child growth and monitoring -Monthly (0–2 year olds) -Bimonthly (2–5 year olds) Provision of anti-parasites, vitamins, and iron supplements Vaccinations (0–5 year olds)	***Bono a la oferta*** ***(teacher transfer)*** C$60 per child per year given to teacher/school (US$5)

a. As described in the text, a small percentage of households were excluded.

The amounts for each transfer were initially determined in U.S. dollars (US$) and then converted into Nicaraguan Córdobas (C$) in September 2000, just before RPS began distribution. Table 1 shows the original US$ annual amounts and their C$ equivalents (using an exchange rate of 12.85 Córdobas per dollar): the food security transfer was US$ 224 a year and the school attendance transfer, US$ 112. On its own, the potential food security transfer represents about 13 percent of total annual household expenditures in beneficiary households before the program. A household with one child benefiting

from the education component would receive additional transfers of about eight percent, yielding a total potential transfer of approximately 21 percent of total annual household expenditures. Over the two years, the actual average monetary transfer (excluding the teacher transfer) was nearly $C 3,800 (or 18 percent of total annual household expenditures). This is approximately the same percentage of total annual household expenditures as the average transfer in PROGRESA, but more than five times as large as the transfers given in PRAF. The nominal value of the transfers remained constant, with the consequence that due to inflation the real value of the transfers declined by about eight percent during two years of transfers in the pilot phase. The value of the supply side services, as measured by how much RPS paid to the health care providers and the value of vaccines, anti-parasites, etc., was also substantial, on average over US$ 100 per beneficiary household.

To enforce compliance with program requirements, beneficiaries did not receive all components of the transfer when they failed to carry out any of the conditions shown in Table 2. The table demonstrates that there are four different "types" of beneficiary households in the program, who receive different transfers and have to fulfill different requirements. Households with no children in the targeted age ranges are only eligible for the food security transfer, but at the same time need only attend the health education workshops in order to qualify for continued receipt of the transfers. Households with children under age 5 (but without children ages 7–13 who have not completed the fourth grade) are also eligible for the food security transfer only, but have more requirements to fulfill, related to their young children. Households with children ages 7–13 who have not completed the fourth grade are eligible for both the food security and education transfers and required to comply with the schooling related conditions. If, in addition, there are children under age 5 in the household, it is eligible for the same transfers but has more requirements to fulfill; in particular, those related to the health controls for young children.

RPS allows households to receive a partial transfer if they comply with the health requirement and not the education requirement or vice versa. During the first two years of delivering transfers, approximately ten percent of beneficiaries were penalized at least once and therefore did not receive, or received only part of, their transfer. It was also possible for households to be expelled from the program, e.g., for repeated non-compliance. At the start of the program, about 90 percent of the households in the intervention areas were participating in the program. Less than one percent of households were expelled from the program during the first two years of delivering transfers, though five percent voluntarily left the program, e.g., by electing to drop out and/or by migrating out of the program area.

Table 2: Nicaraguan RPS beneficiary co-responsibilities monitored in the Pilot Phase

	HOUSEHOLD TYPE			
	Households with no targeted children	Households with children ages 0–5	Households with children ages 7–13 who have not completed 4th grade	
	(A)	(B)	(C)	(B) + (C)
PROGRAM REQUIREMENT				
Attend bimonthly health education workshops	✓	✓	✓	✓
Bring children to prescheduled healthcare appointments Monthly (0-2 years) Bimonthly (2-5 years)		✓		✓
Adequate weight gain for children under 5[a]		✓		✓
Enrollment in grades 1 to 4 of all targeted children in the household			✓	✓
Regular attendance (85 percent, i.e., no more than 5 absences every two months without valid excuse) of all targeted children in the household			✓	✓
Promotion at end of school year[b]			✓	✓
Deliver teacher transfer to teacher			✓	✓
Up-to-date vaccination for all children under 5 years[b]		✓		✓

a. The adequate weight gain requirement was discontinued in Phase II starting in 2003.
b. Condition was not enforced.

Only the designated household representative could collect the cash transfers, and where possible, RPS appointed the mother to this role. As a result, more than 95 percent of the household representatives were women. These representatives attended the health education workshops and were responsible for ensuring that the requirements for their households were fulfilled.

2.3 Program Impact

Before examining the role of RPS during an economic downturn, I summarize the findings from the evaluation, based on a randomized, community-based intervention with measurements before and after the intervention in both treatment and control *comarcas*.

Overall, RPS had positive (i.e., favorable) and significant double difference estimated average effects on a broad range of indicators and outcomes. Where it did not, it was often due to similar, though smaller, improvements in the control group. Nearly all estimated effects were larger for the extremely poor, often reflecting their lower starting points (e.g., percentage of children matriculating before the program)—among poorer beneficiaries there was simply more potential for improvement on many of the indicators. As a result, the program has reduced inequality of these outcomes across expenditure classes.

RPS in its pilot phase supplemented per capita annual total household expenditures by 18 percent, on average. For beneficiary households, this increase compensated for the large income loss experienced by non-beneficiaries during this period, while producing a small overall increase in expenditures. Most of the increase in expenditures were spent on food; the program resulted in an average increase of $C 566 in per capita annual food expenditures and an improvement in the diet of beneficiary households. Expenditures on education also increased significantly though there was no discernable effect on other types of investment expenditures. Labor market participation was apparently little changed with the program, though there was an indication of slightly fewer hours worked on average in the last week. While not designed as a traditional safety net program in the sense of reacting or adjusting to crises or shocks, the economic difficulties experienced by these communities enabled RPS performed like one, aiding households during a downturn.

For schooling, RPS produced a massive average net increase in enrollment of 18 percentage points and an even larger increase (23 percentage points) in current attendance for the target population. Examining the number of children in grades 1–4 who advanced two grades between 2000 and 2002, RPS led to an average increase of 7 percentage points, despite the fact that advancement past 4th grade was not a formal requirement of the program. In tandem with the increased schooling, the percentage of children ages 7–13 that were working declined by 5 points.

Regarding child health care, RPS induced an average net increase of 11 percentage points in the participation of children under three years of age in the VPCD program. At the same time, the services provided by the program, as measured by process indicators including whether the child was weighed and whether their health card was updated, improved even more. Participation by children ages 3–5 also increased substantially. While not possible to statistically demonstrate that RPS increased vaccination coverage for children ages 12–23 months in the intervention group (relative to the control group), it was demonstrated that vaccination rates climbed over 30 percentage points in the intervention and control areas at a time when they were on average decreasing in the remaining *comarcas* in the very same municipalities. One would be hard pressed not to attribute at least some part of this substantial improvement to RPS.

Finally, the more varied household diet and increased use of preventive health care services for children have been accompanied by an improvement in the nutritional status of beneficiary children age five. The net effect was a five-percentage point decline in the percentage of children who were stunted. This decline is more than 1½ times faster than the rate of annual improvement seen at the national level between 1998 and 2001—very few programs in the world have shown such a decrease

in stunting in such a short time. Despite improvements in the distribution of iron supplements to these same children, however, RPS was unable to improve hemoglobin levels or to lower rates of anemia.

3. DATA SOURCES, THE SETTING, AND METHODOLOGY

3.1. Data Sources

The evaluation design was based on a randomized, community-based intervention with measurements before and after the intervention in both treatment and control communities. One-half of the 42 *comarcas* were randomly selected into the program; thus, there are 21 *comarcas* in the intervention group and 21 distinct *comarcas* in the control group (IFPRI 2001). Given the geography of the program area, control and intervention *comarcas* are in some cases adjacent to one another, a theme I return to below. The selection was done at a public event with representatives from the *comarcas*, GON, IDB, IFPRI, and the media present. The 42 *comarcas* were ordered by their marginality index scores and stratified into seven groups of six each. Within each stratum of six *comarcas*, randomization was achieved by blindly drawing a colored ball without replacement (starting with three blue for intervention and three white for control) from a box after the name of each *comarca* was called out. Thus, three *comarcas* from each stratum were randomly selected for inclusion in the program, leaving the other three as controls for the evaluation.

The original evaluation was designed to last for one year; that is, the control group was meant to be a control for only one year since there was not sufficient capacity to implement the intervention everywhere at the same time. Due to delays in funding for RPS as a result of a governmental audit unrelated to the program, incorporation of beneficiaries in the control *comarcas* was postponed until 2003, extending the possible length of the treatment-control evaluation by more than a year. The control *comarcas* had to wait a little over two years before being fully incorporated into the program.

The data used here are from an annual household panel data survey implemented in both intervention and control areas of RPS before the start of the program in 2000 and after the program began operations, in 2001 and 2002.[48] The questionnaire was a comprehensive household questionnaire based on the 1998 Nicaraguan Living Standards Measurement Survey (LSMS) instrument, expanded in some areas (e.g., child health and education) to ensure that all the program indicators were captured, but cut in other areas (e.g., income from labor and other sources) to minimize respondent burden and ensure collection of high quality data from a single visit interview. As a result, one area where it is weaker than the typical LSMS comprehensive household survey is the employment module; the RPS survey only covers activities carried out in the last week and does not ask about earnings from those or any other activities. An anthropometry module for children under age five was also implemented in 2000 and 2002, but not in 2001 and a *comarca*-level community survey was implemented in 2001. Table 3 outlines the primary data sources used in the analysis.

[48] Results reported on here are based on the September 2003 release of the RPS evaluation data.

Table 3: Nicaraguan RPS data sources

Survey	RPS 2000 census	RPS 2000 Baseline	RPS 2001 Follow-up	RPS 2002 Follow-up
Month of survey	May	August/September	October	October
Household questionnaire	Includes last week labor activities and land holdings	LSMS with shortened labor module	LSMS with shortened labor module	LSMS with shortened labor module
Anthropometry questionnaire		Children < 5 years		Children < 5 years
Comarca-level questionnaire			Coffee cultivation and *comarca* shocks	

The survey sample is a stratified random-sample at the *comarca* level from all 42 *comarcas* described above, half of which were randomly selected for the program. As such, the areas represented comprise a relatively poor part of the Central Region in Nicaragua but the sample is not statistically representative of the six municipalities or any other areas of Nicaragua, for that matter. At the same time, there is no reason to believe that responses to the program by these households are systematically different from other rural Nicaraguan households. Forty-two households were randomly selected from each *comarca* using a census carried out by RPS three months prior to the survey as the sample frame and yielding an initial target sample of 1,764 households.[49] The first wave of fieldwork was carried out in late August and early September 2000, without replacement; that is, when it was not possible to interview a selected household, another household was not substituted in its place.

While there was a great deal of progress in getting RPS started throughout 2001, it was not possible to design and implement all the components according to timelines established at the outset. In particular, the healthcare component of the intervention was not initiated until June 2001. There were also some delays in the payment of transfers to households during the year, due to the governmental audit (mentioned earlier) that effectively froze RPS funds. For these reasons, the RPS 2001 follow-up survey was postponed to the beginning of October, to allow additional time for the interventions to take effect and for five of the scheduled six payments to be effected. Of course, the advantage of the original plan, with the scheduled RPS 2001 follow-up at exactly the same time of year as in the 2000 baseline, was that it obviated the need to control for seasonal variation, for example in expenditures or labor force participation. With a randomized control group, however, the possible biases introduced by seasonality can be controlled for using the double-difference techniques described below. This difference in the timing of the survey, then, does not present a serious problem for the

[49] IFPRI (2001) describes the sample size calculations and Maluccio and Flores (2004) describe the baseline and follow-up samples in more detail.

estimates of program effects presented, though it is a potential problem for making definitive statements about changes over time *within* the control group, a concern addressed in Section 4.1.

First round non-response and attrition in the survey are also potential concerns for the analysis. Overall, 90 percent of the random sample was interviewed in the first round yielding 1,581 successfully completed household interviews, a little more than ten percent of the area's population (see Table 4). In a handful of *comarcas* the coverage was 100 percent, but in six it was under 80 percent. For the follow-up surveys in 2001 and 2002, the target sample was limited to these 1,581 first round interviews. In 2002, just over 90 percent of these were interviewed, on a par with similar surveys in other developing countries (Thomas, Frankenberg, and Smith 2001; Alderman et al. 2001). Again, however, coverage in six of the *comarcas* was substantially worse, where less than 80 percent were successfully re-interviewed. This attrition is unlikely to have been random, a theme taken up in section 4.5. Because the same target sample was used in 2002 as in 2001, regardless of whether the household was interviewed in 2001, some households that *were not* interviewed in 2001 *were* interviewed in 2002, and vice versa. The sample of households for which there is a complete set of observations (one in each of the three survey rounds) is 1,396, smaller than the 1,434 shown in the first row of the third column of Table 4. The households are about evenly divided between intervention and control groups, indicating that the level of attrition, at least, was not significantly different between them.

Table 4: Nicaraguan RPS evaluation survey non-response and subsequent attrition

	2000	2001	2002
Completed Interview	1581	1490	1434
	(89.6)	(94.2)	(90.7)
Completed interview in all 3 rounds	1396	1396	1396
	(79.1)	(88.3)	(88.3)
...of which			
Intervention	706	706	706
(percent of targeted intervention sample)	(80.0)	(87.2)	(87.2)
Control	690	690	690
(percent of targeted control sample)	(78.2)	(89.5)	(89.5)
Not Interviewed			
Uninhabited dwelling	60	51	83
Temporary absence	100	28	46
Refusal	16	6	12
Urban (misclassified as rural)	6	0	0
Lost questionnaire	0	6	6
Target Sample	1764	1581	1581

Notes: Percent of target sample in parentheses.

3.2. *The importance of coffee in Nicaragua and the "coffee crisis"*

Coffee production in Nicaragua more than doubled from 932 thousand quintals (or hundred-weight) in 1990 to 2,083 in 2000, but declined to 1,800 in 2001.[50] Over this ten-year period, productivity increased dramatically, with on farm average yields more than doubling. The vast majority of coffee produced in Nicaragua is exported, and most of it is strictly high grown (SHG) arabica (grown at altitudes greater than 800 meters) and therefore commands a high price; indeed Nicaraguan coffee often sells at a premium (e.g., in July 2002 it sold for a $3 premium over the New York coffee C contract price for September delivery at the exchange for strictly high grown per quintal). Over the last 5 years, coffee exports averaged US$140 million, or about one-quarter of total export earnings, and it was the single most important agricultural export (Kruger, Mason, and Vakis 2003).

In addition, the coffee sector is a major employer in the rural economy. Estimates of the importance of coffee in rural labor markets vary substantially, from 20 percent of the rural labor force employed at some point in the year in the coffee sector (Kruger, Mason, and Vakis 2003) to 40 percent (Varangis et al. 2003). Even if the more conservative estimates are taken, it is clearly an important source of rural employment. Approximately two-thirds of this employment is seasonal, while the remainder is self-employed or permanent farm workers (Varangis et al. 2003).

Hence, despite the fact that Nicaragua is only a minor producer on the world stage—and therefore a price-taker in world markets—coffee is a major export crop and employer for the Nicaraguan economy, and declining prices have had important effects on the economy. International nominal year-end prices in U.S. cents per pound reported for Arabica coffee were nearly 160 in 1997 but had dropped over 50 percent to 71 cents in 2000, and again by a third to 46 and 40 cents in 2001 and 2002, respectively.[51] Unit export values declined in recent years in tandem with the price declines, from $121 per quintal in 1997 to $81 in 2000, and $54 in 2001. The latter prices are unlikely even to cover production costs for some producers (Lewin and Giovannucci 2003). It is this fact that, while perhaps not coming as a surprise (to coffee analysts, anyway), leads many to refer to the current situation as a crisis. Many farmers have been forced to reduce or abandon coffee production, and it has been estimated that 35,000 permanent and 100,000 seasonal jobs have been lost (IDB 2001).

3.3. *Coffee cultivation in the RPS sample*

Via a *comarca*-level survey that accompanied the household-level instrument in 2000 and was administered to key informants, 21 of the 42 *comarcas* in the sample were identified as being areas where coffee is cultivated, 10 in the intervention group and 11 in the control group (see Table 5). Because the *comarcas* are spread across six municipalities in two departments, however, this apparently even allocation masks the fact that all the coffee producing areas are located in the department of Matagalpa, which is about 100 kilometers closer to Managua than Madriz. As such, in addition to analyzing the complete sample, I will also assess whether, and how, limiting the sample to *comarcas* in Matagalpa changes any of the results presented below.

[50] Except where otherwise cited, statistics cited in this paragraph are drawn from Varangis et al. (2003).

[51] The world coffee prices are December values from the International Coffee Organization.

Table 5: Coffee cultivation in RPS sample at *comarca* level

Type of *comarca*	Coffee cultivating	Non-coffee cultivating	Total
Intervention	10	11	21
Control	11	10	21
Total	21	21	21

From the labor force participation questions asked about the previous week (in each survey), we can glean partial information on the extent to which individuals and households are participating in the coffee industry. For agricultural labor activities, the type of crop was not numerically coded. Interviewers, however, were trained to write a brief description of the activity and when coffee was involved, the description typically included the word "café." All jobs in which "café" was noted down are treated as coffee sector jobs—therefore figures presented below most likely represent a lower bound for individual and (to a lesser extent) household-level participation in the last week since it seems likely that interviewers at times neglected to specify coffee when the work was in coffee. In addition, given the seasonal and sporadic nature of coffee production, the one-week reference period is almost certainly inadequate to capture all those who ever work in coffee, and is also very likely to miss many of those who occasionally work in coffee (for example, only during the harvest season), further understating involvement in the industry, though it is difficult to say by how much using only the RPS evaluation data.[52] In describing patterns and descriptive regressions using this information, then, I emphasize that in comparison to the other analyses, results that pertain to household-level participation in the coffee sector are less definitive.

While in August and September 2000 nearly eight percent of those reporting that they had worked in the previous week indicated that they worked in coffee, this percentage had dipped to under five percent in 2001 and 2002. These workers were spread across 14 percent of the households in 2000 and 10 percent in 2001 and 2002. These percentages appear to be low in comparison with estimated levels of about 20 percent from the rural subsample of the 2001 LSMS (Kruger, Mason, and Vakis 2003). Hardly any of the coffee workers resided outside an identified coffee growing area, however, so the percentage participating in those areas alone is twice as large. This pattern is consistent with the demarcation of coffee and non-coffee regions and suggests that the *comarca*-level information is broadly accurate. As with most crops, the demand for casual labor in coffee rises during the harvest season, which begins in October but peaks in December and January. The decline between 2000 and 2001/2, then, is somewhat surprising since during a typical year the seasonal difference in the timing

[52] Another source of information on participation in the coffee sector is the food expenditure and consumption module in the questionnaire, where those food items consumed from own-production, or received as in-kind payment, are indicated. In each year, a small percentage of households report consuming coffee from these sources in the previous two weeks. When this information is contrasted with those who worked in coffee in that last week, however, only about half of those indicating consumption of coffee from these sources reported working in the coffee sector, suggesting that the short reference period and use of written job descriptions may be understating participation in the sector by as much as one-half.

of the survey would lead to more reported coffee work in the October period, not less. This is the first piece of evidence suggesting that participation in the coffee sector is declining.

Between 10 and 15 percent of those reporting working in the coffee sector indicated that they were self-employed farmers (from less than two percent of all households), and this percentage changed little over the three surveys. Over two-thirds of those working in coffee are men and only ten percent are children. In 2000, seven percent of those working in coffee indicated that they were employed as permanent workers on a coffee farm, but virtually none did in 2001 or 2002, consistent with local media reports that larger coffee farms (which are the ones that employ permanent laborers) had to release labor in recent years. As a result of these small sample sizes, it is not feasible to distinguish between coffee farmers (the sample has on average 30 of them in each year) and laborers in most of the analyses presented below. A simple comparison of per capita expenditures across these two groups in the coffee sector, however, does show that coffee farmers were substantially better off in 2000, with 30 percent higher average expenditures than households with coffee laborers who were not self-employed.

The average percentages across the years belie the fact that many individuals and households report moving in and out of coffee—only one-third of the households reporting participation in coffee in 2000 also report participation in 2002, for example. This movement is shown in household-level transition matrices between 2000 and 2001 (Table 6a) and between 2001 and 2002 (Table 6b). A household is defined to be in the coffee sector if any adult (aged 15 or older) in the household reported any sort of participation in coffee in the last week. Between 2000 and 2001 there seems to have been significant exit from the coffee sector (and this despite the timing of the survey which favors greater participation in October than in August and September)[53] whereas on net only one percent exited between 2001 and 2002. Much of the variability or churning (e.g., in 2001–2002 where nearly as many households entered as exited) is almost certainly due to the short reference period considered and likely does not reflect longer run changes. Thus the patterns seen here are consistent with the media representation of a crisis in the 2000–2001 season, and consequent reduced labor demand on coffee farms; households appear to have been adjusting and "exiting" coffee over time in these areas. Of course, this description of the data considers the entire sample and therefore conflates effects of the crisis with those of RPS. Similar, though slightly weaker patterns emerge when the analysis is restricted to households in the control group only. I analyze these transitions into and out of coffee more formally in section 4.3 below.

[53] Supporting the hypothesis that there is seasonal variation in participation in coffee is evidence taken from the May 2000 RPS population census which shows only four percent of those reporting working in coffee in the last week since labor demand is even lower during that part of the coffee season.

Table 6a: Coffee cultivation in RPS sample at household level (2000–2001)

	Coffee cultivating in 2001	Non-coffee cultivating in 2001	Total
Coffee cultivating in 2000	74 (5.3)	128 (9.2)	202 (14.5)
Non-coffee cultivating in 2000	65 (4.7)	1129 (80.8)	1194 (85.5)
Total	139 (10.0)	1257 (90.0)	1396 (100.0)

Table 6b: Coffee cultivation in RPS sample at household level (2001–2002)

	Coffee cultivating in 2002	Non-coffee cultivating in 2002	Total
Coffee cultivating in 2001	59 (4.2)	80 (5.7)	139 (10.0)
Non-coffee cultivating in 2001	72 (5.2)	1185 (84.9)	1257 (90.0)
Total	131 (9.4)	1265 (90.6)	1396 (100.0)

3.4. Econometric methodology

The empirical approach exploits two key features of the data allowing one to overcome the vast majority of typical concerns regarding econometric estimation and causal inference: 1) the randomized design of the evaluation and 2) the panel structure, i.e., the fact that the same households were interviewed over time, before and after RPS was implemented and in both intervention and control *comarcas*. I estimate a series of reduced form specifications that essentially estimate program effects, differentiating them for households residing in coffee or non-coffee growing areas.[54]

[54] This approach differs from that of Coady, Olinto, and Caldés (2003) in that they estimate structural equations. As in the work presented here, identification rests primarily on the randomization of the intervention. An advantage to their approach is that imposing more structure (and its attendant assumptions) facilitates exploration of the pathways of effects and all coefficients on variables that are interacted with

The methodology used is based on difference-in-difference techniques and yield what is commonly referred to as the "average program impact."[55] The resulting measures can be interpreted as the expected effect of implementing the program in a similar population elsewhere. The method is shown in Table 7. The columns distinguish between groups with and without the program (denoted by I for intervention and C for control) and the rows distinguish between before and after the program (denoted by subscripts 0 and 1). Anticipating one of the analyses presented below, consider the measurement of school enrollment rates for children. Before the program we would expect the average percentage enrolled to be similar for the two groups, so that the quantity $(I_0 - C_0)$ would be close to zero. After the program has been implemented, however, we would expect differences between the groups as a result of the program. Furthermore, because of the random assignment, we expect the difference $(I_1 - C_1)$ to measure the effect directly attributable to the program. Indeed, $(I_1 - C_1)$ is a valid measure of the average program impact under this experimental design. A more robust measure of the effect, however, would account for any preexisting observable or unobservable differences between the two randomly assigned groups: this is the double difference obtained by subtracting the preexisting differences between the groups, $(I_0 - C_0)$, from the difference after the program has been implemented, $(I_1 - C_1)$.

Table 7: Calculation of the double-difference estimate of average program effect

Measurement	Intervention group with RPS program	Control group without RPS program	Difference across groups
Follow-up	I_1	C_1	$I_1 - C_1$
Baseline	I_0	C_0	$I_0 - C_0$
Difference across time	$I_1 - I_0$	$C_1 - C_0$	Double-difference $(I_1 - C_1) - (I_0 - C_0)$

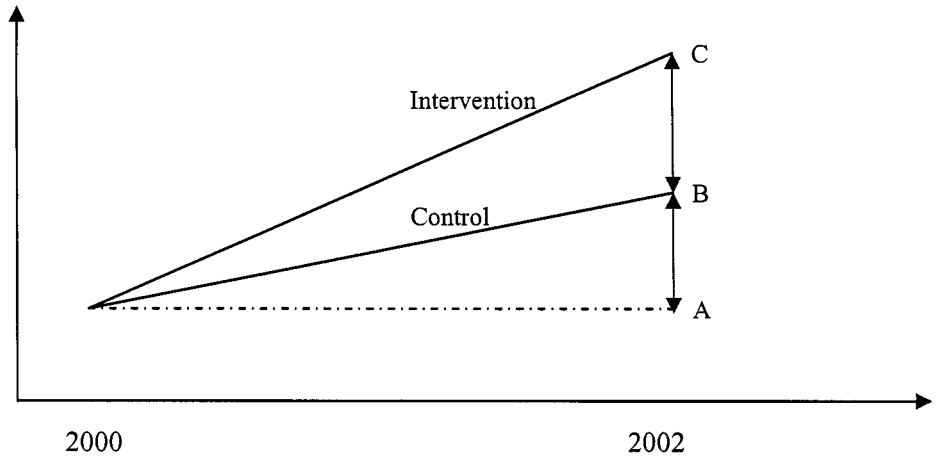
An alternative interpretation of the double-difference estimator emerges if one first considers the differences *within* the (intervention or control) groups. This approach begins with a naïve estimator of the program effect, the difference over time for the intervention group, $(I_1 - I_0)$. This is naïve because it would include all changes over time in enrollment rates, regardless of what is causing them. For example, if increases in public investment nationally were improving school access and leading to changes in enrollment, these effects would show up in the difference over time in the intervention group, in addition to the effects attributable to the program. The obvious measure for the non-program related change over time in the intervention group is the change over time in the control group, $(C_1 - C_0)$. Thus we estimate the average program impact by first considering the total change over time in the intervention group, and then subtracting from this the change over time in the control group. As above, this yields the double-difference estimator.

program availability, such as ownership of coffee land, are consistently estimated. I do not follow their approach mainly because of the relatively poor quality of household-level information on participation in the coffee sector in the RPS evaluation data.

[55] Ravallion (2001) provides a useful, and enjoyable, discussion on this and related evaluation tools.

The alternative interpretation is probably best illustrated graphically as shown in Figure 1. For an arbitrary indicator that we measure over time, we assume (for the graph) that as a result of the randomization both the intervention and control groups start at the same level. No change in the indicator over time would lead to the outcome depicted by point A in 2002; if we were only following the intervention group we would then naively calculate the effect of the program as the quantity (C – A). However, as the control group makes clear, there was a trend over time that led to an improvement, even in the absence of the program, of (B – A). Were we to ignore this we would overstate the effect of the program. Instead, our estimate of the program effect is (C – B); this is the double difference estimate. In the case where rather than increasing, the trend line for the control group were declining, ignoring that effect would tend to understate the program effect.

Figure 1: Illustration of the double difference estimate of average program effect



For this work, the technique just described is extended to a triple difference, where the third difference is whether or not the household resides in an area where coffee is cultivated. A simple triple difference estimating equation for two periods is shown in equation (1).

$$(1)\quad E_{ict} = \alpha_0 + \alpha_1 Y_t + \alpha_2 K_c + \alpha_3 P_c + \alpha_4 Y_t K_c + \alpha_5 K_c P_c + \delta_2 Y_t P_c + \delta_3 Y_t P_c K_c + (\mu_c + \mu_i + \nu_{ict})$$

Where

E_{ict} = outcome variable of interest for household *i* in *comarca c* at time *t*

Y_t = (1) if second period (or year)

K_c = (1) if coffee cultivating *comarca c*

P_c = (1) if program *comarca c*

μ_c = all (observed and unobserved) *comarca*-level time invariant factors

μ_i = all (observed and unobserved) household-level time invariant factors

ν_{ict} = unobserved idiosyncratic household and time varying error

and all the α_j and δ_j are unknown parameters.

The parameters of interest are δ_2, the "double difference" estimator of the average program effect in non-coffee growing areas and δ_3, the "triple difference" estimator of the average program effect in coffee growing areas relative to non-coffee growing areas. The total estimated program effect in coffee growing areas, then, is $\delta_2 + \delta_3$.

In section 4.4, I slightly modify this framework in order to introduce household-level shock information for the 2-year period (collected in the follow-up surveys). Rather than estimate the household fixed-effects regression in levels form as presented above, I take first differences (year 2001 – year 2000 and year 2002 – year 2001) and then introduce on the right hand side indicators for the shocks (described in more detail in section 4.4).

One potential concern about the classification into coffee growing areas is that because coffee cultivation requires specific agro climatic conditions, the opportunity set for production technologies may differ across areas that do and do not cultivate coffee. Put another way, the fact that coffee is grown in an area is related to other production and labor market decisions in the area. A second concern is that households choosing to live in coffee or non-coffee cultivating regions are different in other ways that may be directly associated with the outcome variables under consideration. These suggest possible correlation between the coffee region indicator and μ_c or μ_i, that, if not controlled for would contaminate estimates of all coefficients on any variable including the coffee indicator, with the exception of those in which it is interacted with the random program dummy variable, P_c. To avoid this possibility, household fixed effects are explicitly included in all the analyses, thereby controlling for any time-invariant unobserved heterogeneity that may be associated with the location of the household. Another implication of including household fixed effects is that all estimated results implicitly include *comarca*-level fixed effects as well, so that I control for the potential problem that the coffee indicator is correlated with any omitted fixed factors at the *comarca* level. Of course, all other time-invariant factors, such as K_c, now drop out of the relation and (extending to all three survey years) we are left with (2) as the main estimating equation with Y_1 (Y_2) a dummy for 2001 (2002).

$$(2)\ E_{ict} = \alpha_0 + \alpha_1 Y_1 + \alpha_2 Y_2 + \alpha_3 Y_1 K_c + \alpha_4 Y_2 K_c + \delta_{21} Y_1 P_c + \delta_{22} Y_2 P_c + \delta_{31} Y_1 P_c K_c + \delta_{32} Y_2 P_c K_c + (\mu_i + \mu_c + \nu_{ict})$$

δ_{21} is the "double difference" estimator for 2001 (relative to 2000) and δ_{22} for 2002 (relative to 2000). δ_{31} and δ_{32} are the respective "triple difference" estimators.

The coffee versus non-coffee classification at the *comarca* level is necessarily crude—neither the coffee labor nor the coffee production markets are completely segregated across *comarcas* in the sample. The fact that coffee is cultivated in an area does not imply that all households in the area participate in the coffee industry (via labor, production, marketing, etc.) and those not directly participating could be affected less by coffee price declines though they could still be affected, for example by changes in labor supply for non-coffee sector jobs. Conversely, households living in areas where coffee is not planted may still participate in the industry as (temporary) migrant laborers, a common practice during harvest periods, so that they could be directly affected by price declines. As a result, the estimated coefficient on an indicator of whether an area has coffee cultivation (relative to one that does not) interacted with the year 2001, for example, will tend to understate the size of the effect of the price decline for those households *actually* participating in the industry, and therefore directly affected, a result similar to the difference between the intent to treat effect and the treatment effect. The majority of analyses presented below estimate this "intent to treat" effect, in large part

because of the data limitations on coffee participation at the household level. The approach has the advantage of being conservative, thereby increasing confidence in the results when significant differences are found.

Finally, I emphasize that program effects are identified by the randomized design of the intervention. They do not, for example, condition on household choices or rely on treating the rapid coffee price decline as a shock—an assumption that is hard to maintain in the face of historical trends and given that the recent downturn in prices began in the late 1990s whereas the data I examine start in 2000.[56] As such, however, the results presented below are likely to understate the effects of RPS in coffee growing regions to the extent that households have already undertaken various strategies in reaction to the continued price declines. This is in the same direction as the possible biases described above and reinforce the claim that the methodology used is a conservative one. With the exception of section 4.4 where I examine household-level idiosyncratic shocks, I emphasize throughout that the estimates presented refer to the effects of the program during an economic downturn, and not in response to an economic shock.

In the analysis that follows, I work with all (relevant) individuals or households from the balanced panel sample (of 1,396 households interviewed three times each) to keep from changing sample composition in estimating the differences between 2000 and 2001 and between 2000 and 2002. In all but the few instances that are indicated, the estimates control for household-level fixed effects as described above.

4. RESULTS

4.1. The changing environment: Control group

I first consider patterns of expenditures, labor force participation, school enrollment rates, and child nutritional status in the control areas during the period 2000–2002, contrasting coffee and non-coffee growing areas. To summarize what follows, the evidence shows that expenditures have declined over the period while work effort has intensified, and these changes are on average substantially larger in coffee-growing areas. Primary enrollment rates improved modestly over the period, somewhat more so within coffee growing areas, and the incidence of child labor for young boys declined in all areas.

In the top panel of Table 8, I present descriptive results for expenditure and labor force participation measures over time for the control group. Real per capita annual household total expenditures measured in base year 2000 Córdobas dropped by nearly 20 percent between 2000 and 2001, but held

[56] While coffee prices have declined substantially in recent years, the current crisis was not unexpected since the industry has been anticipating large increases in Brazilian output for some time. "Apart from over-supply, there are two principal factors underling the current crisis:

- a structural change in the nature of supply, particularly increases in both the quantity and quality of Brazil and Vietnamese coffees, and
- Structural changes in demand, comprising increasing demand for high-end specialty products, new technology allowing greater flexibility in blending, and generational shifts in the appeal of different types of coffee products" (Lewin and Giovannuci 2003, page 5).

steady between 2001 and 2002.[57,58] A similar pattern, but with a larger percentage decline, is observed for per capita household food expenditures. At the same time that expenditures were declining, labor supply was increasing, as measured by the total number of hours worked by household members and the average number of hours worked per worker (shown in the third and fourth columns, respectively). In 2001 and 2002, workers reported working on average more than one additional hour a week, compared to in 2000. Households in the control group faced declining expenditures despite increased labor hours.

An important consideration is whether these patterns hold for both poor and non-poor households. To examine this, I consider two separate categorizations of households, one using their predicted poverty status based on a proxy means model that predicts per capita expenditures for each household based on a set of indicators measured at the household level that are highly correlated with logarithmic per capita expenditures ($R^2 > 0.50$) and a second based on the size of their landholdings being less or greater than one hectare.[59] Both of these show that while expenditures decreased for both poor and non-poor groups over the period, the decline was concentrated in non-food expenditures and sharper for the less poor, the group that may have been better able to withstand reductions; the labor force participation trends were similar across groups (results not shown).

There were two possible factors leading to a downturn in the area, a drought in 2001 and the continued decline in coffee prices.[60] In the 2001 *comarca*-level survey, 38 of 42 comarcas reported the drought as a significant event during the past year, indicating that it was pervasive in the program areas. To explore whether the decline was specifically related to coffee, I compare coffee and non-coffee growing areas (the bottom panel of Table 8). Households in coffee growing areas started out with somewhat higher (by about 10 percent) expenditures but this advantage was reversed over the period as they experienced significantly larger declines in expenditures. Average per capita expenditures in the non-coffee growing areas were about ten percent lower in 2001 and 2002 than in 2000, but a further 20 percent lower in coffee growing regions. Total hours worked in the last week by household members increased modestly in 2001, by about 5 hours per week, and substantially in 2002, about 18 hours per week. Average hours per worker in the last week increased in coffee growing areas in both 2001 and 2002. Changes in households in coffee growing areas are driving the overall average trends depicted in the first panel of Table 8.

[57] All reported expenditures have been deflated to 2000 base Córdobas using the Nicaraguan consumer price index reported by the Central Bank of Nicaragua for which there was approximately four percent inflation per year in 2001 and 2002.

[58] The drop in expenditures in the control group was not due to changes in household size or family composition, which did not significantly change. Another possibility is that there are biases in the reporting of expenditures. For example, in control areas it is possible that non-beneficiaries who had learned about the program understated their expenditures in an effort to appear more in need of the program. However, at this stage, the program was being implemented using only geographical targeting, and being more or less poor would not have affected their eligibility. Additional evidence that the decline in expenditures is real comes from the decline in nutritional status of children, which is not subject to the same sort of possible reporting bias.

[59] I use predicted poverty status rather than actual measured expenditure poverty since the latter is likely to lead to regression to the mean given measurement errors in expenditures. IFPRI (2002) contains the details.

[60] Hurricane Mitch (October 1998) did not severely affect the RPS program areas so it is not a concern for interpreting the results.

Table 8: Expenditures and labor force participation in the control group, 2000–2002

	Ln per capita real annual expend.	Ln per capita real annual food expend.	Total hours worked last week	Avg hours per worker worked last week
Year 2001	-0.1895 ***	-0.2473 ***	2.0391	1.4082 ***
	(7.50)	(8.55)	(1.03)	(2.92)
Year 2002	-0.1767 ***	-0.2331 **	5.9565 ***	1.1056 **
	(6.99)	(8.06)	(3.01)	(2.29)
Constant	8.0166 ***	7.6370 ***	84.1884 ***	25.5777 ***
	(448.9)	(373.6)	(60.25)	(74.97)
Year 2001	-0.0928 ***	-0.1324 ***	-0.1701	-0.0088
	(2.77)	(3.46)	(0.07)	(0.01)
Year 2002	-0.1053 ***	-0.1661 ***	-3.6031	-1.7101 ***
	(3.15)	(4.34)	(1.38)	(2.70)
Year 2001 × coffee	-0.2208 ***	-0.2626 ***	5.0476	3.2377 ***
	(4.37)	(4.54)	(1.28)	(3.38)
Year 2002 × coffee	-0.1629 ***	-0.1531 ***	21.8415 ***	6.4331 ***
	(3.22)	(2.64)	(5.55)	(6.72)
Constant	8.0166 ***	7.6370 ***	84.1884 ***	25.5777 ***
	(451.9)	(376.1)	(60.95)	(76.14)
F-test Year 2001 + Year 2001 × coffee	68.41 ***	82.80 ***	2.73 *	20.22 ***
	[<0.01]	[<0.01]	[0.10]	[0.07]
Joint test year 2002 +Year 2002 ×coffee	50.05 ***	54.06 ***	38.14 ***	43.25 ***
	[< 0.01]	[<0.01]	[<0.01]	[<0.01]
F-test overall regression	22.94 ***	28.57 ***	10.83 ***	13.72 ***
	[<0.01]	[<0.01]	[<0.01]	[<0.01]
Number of observations	2070	2070	2070	2070

Notes: Household-level fixed-effects estimation in control group only. T-statistics reported in parentheses and p-values in brackets. * indicates significance at 10%, ** indicates significance at 5%, and *** indicates significance at 1%.

I next consider how school enrollment rates and child labor have changed over time in the control group. Since schooling and child labor decisions depend on the opportunity cost of children's time as well as costs of schooling and the resources the household commands, it is not possible a priori to predict the direction of the effects of an economic downturn since opportunity costs and resources may both be changing, with opposing influences for household decisions. In 2000, though less than 20 percent reported working, children ages 7–12 were more likely to report having worked in the last week in coffee growing areas versus non-coffee growing areas (19 versus 12 percent). Possibly reflecting these differing work patterns, net primary enrollment rates for the same children were substantially lower in coffee growing areas (66 percent versus 87 percent).

In the first two columns of Table 9, I present household-level fixed-effects estimates of the changes in enrollment rates for girls and boys over time in the control group, conditional on age in years. Enrollment rates were substantially higher in 2000 for girls (83 percent) than for boys (74 percent). For both girls and boys there was hardly any change from 2000 to 2001, but enrollment rates were up significantly for both groups in 2002 (relative to 2000), and more so for boys, who made relative gains over the period. Turning to the bottom panel of the table in which I again distinguish between coffee and non-coffee growing areas, we see that most of the gains over the period were concentrated in coffee growing areas; by 2002, about one-third of the gap between net primary enrollment rates that existed in 2000 between coffee and non-coffee growing areas had been overcome.

While girls in this age group rarely reported working (on average less than 10 percent do), about one-quarter of the boys ages 7–12 reported working in 2000. By 2002, however, this had declined to about 15 percent in both coffee and non-coffee growing areas (see third and fourth columns of Table 9). The same pattern holds for their older siblings between ages 13–17 (not shown). It would seem that the downturn did not adversely affect enrollment and, if anything, had negative effects on the incidence of child labor for young children, possibly because of reduced labor demand.

Table 9: Primary enrollment, child labor, and child nutritional status in the control group, 2000–2002

	(1) if 7–12 year old enrolled: GIRLS	(1) if 7–12 year old enrolled: BOYS	(1) if 7–12 year old working: GIRLS	(1) if 7–12 year old working: BOYS	HAZ children 6–48 months of age
Year 2001	-0.0107	0.0004	-0.0094	-0.0953 ***	
	(0.51)	(0.02)	(0.65)	(4.11)	
Year 2002	0.0468 **	0.0701 ***	-0.0178	-0.0933 ***	-0.1480 *
	(2.09)	(2.87)	(1.15)	(3.74)	(1.77)
Age in years (months in final column)	0.0133 **	0.0202 ***	0.0191 ***	0.0741 ***	-0.0045
	(1.98)	(2.67)	(4.12)	(9.63)	(1.32)
(1) if male	n/a	n/a	n/a	n/a	0.0613
					(0.73)
Constant	0.6997 ***	0.5581 ***	-12.8903 ***	-0.4558 ***	-1.6337 ***
	(11.40)	(8.06)	(3.03)	(6.46)	(13.93)
Year 2001	-0.0139	-0.0288	-0.0057	-0.0772 ***	
	(0.51)	(0.97)	(0.31)	(2.54)	
Year 2002	0.0407	0.0067	-0.0401 **	-0.0870 ***	-0.0639
	(1.42)	(0.21)	(2.03)	(2.68)	(0.63)
Year 2001 × coffee	0.0079	0.0712	-0.0077	-0.0428	
	(0.19)	(1.57)	(0.27)	(0.92)	
Year 2002 × coffee	0.0149	0.1457 ***	0.0551 *	-0.0163	-0.1616
	(0.34)	(3.12)	(1.83)	(0.34)	(1.37)
Age in years (months in last column)	0.0132 **	0.0205 ***	0.0186 ***	0.0743 ***	-0.0046
	(1.97)	(2.72)	(4.02)	(9.64)	(1.35)
(1) if male	n/a	n/a	n/a	n/a	0.0684
					(0.82)
Constant	0.7002	0.5538 ***	-0.1247 ***	-0.4563 ***	-1.6347 ***
	(11.39)	(8.03)	(2.94)	(6.46)	(13.95)
F-test Year 2001 + Year 2001 × coffee	0.04	1.49	0.37	11.41 ***	
	[0.85]	[0.22]	[0.54]	[<0.01]	
Joint test year 2002 +Year 2002 ×coffee	2.66 *	18.01 ***	0.41	7.88 ***	2.38 *
	[0.10]	[<0.01]	[0.52]	[<0.01]	[0.09]
F-test overall regression	3.21 ***	7.19 ***	4.53 ***	20.28 ***	1.84
	[<0.01]	[<0.01]	[<0.01]	[<0.01]	[0.12]
Number of observations	1196	1190	1196	1190	774

Notes: Household-level fixed-effects estimation in control group only for first four columns; ordinary least squares estimation with robust standard errors allowing for heteroskedasticity in the final column (Stata Corporation 2001). T-statistics reported in parentheses and p-values in brackets. * indicates significance at 10%, ** indicates significance at 5%, and *** indicates significance at 1%.

One concern with the above analysis relates to the timing of the surveys since the baseline was carried out in August/September and the follow-up surveys in October. It is possible that seasonal variation in consumption or work could lead to part or all of the observed changes. Indeed, when broken down by recall period, the higher frequency periods show declines in expenditures across the surveys but the longer recall periods (that include non-food items) of 1 month, 6 months, and 12 months do not. If all periodicities, including the longer recall periods, showed a decline, we could more confidently say that the observed declines are not due to seasonal variation in expenditures.[61]

The first piece of evidence I bring to bear on whether the results presented in Table 8 are due solely to seasonality comes from an independent source of information, a quality control survey carried out on a five percent sample of the households interviewed in the 2000 baseline. This survey was implemented in October 2000—so that the timing exactly matches the follow-up surveys. The estimate of the mean and median change in the logarithm of per capita expenditures and per capita food expenditures shows that they increased slightly over the period—in both coffee and non-coffee producing areas, though these increases are not statistically significant. A comparison of number of workers, total hours worked, and average hours worked per worker also show slight (but insignificant) increases. Thus, at least in 2000, the baseline survey year, there was no dramatic decline in expenditures between August and October, supporting the interpretation that the changes we see between 2000 and 2001/2002 are real changes resulting from the economic downturn.

The second piece of evidence supporting the hypothesis that the downward trend in expenditures reflects a real economic downturn and not merely seasonality is shown in the final column of Table 9 where I present the findings for height-for-age z-scores of children ages 6–48 months of age.[62] Due to planning difficulties, the anthropometry survey in 2000 was carried out separately from the main household survey work—in September and early October 2000. Thus, for anthropometry, the 2000 and 2002 surveys were implemented closer together, so that seasonal variation is not a concern when comparing them. There was a significant decline in the nutritional status of children in the control areas over the period, and this decline appears to have been more severe for households in coffee growing regions (see joint F-test in third to bottom row). When broken down by sex, the height-for-age z-scores for boys, which on average was slightly higher than girls at the outset, deteriorated more severely with the result that in 2002 the two were nearly identical (controlling for age)—none of these differences by sex are statistically significant, however.

4.2. Effect of the RPS on households in coffee comarcas

Governmental responses in Central America to the decline in coffee prices, including those of the Nicaraguan government, were slow to materialize and initially have focused attention on producers, traders, and exporters, rather than laborers, even though it is the latter who appear to be more vulnerable. Further, because the initial responses tended to be directed via the financial sector, they favored medium and large enterprises to the detriment of the small-scale producers prevalent in Nicaragua.[63] Since many of these households also cultivate other crops, and the downturn in prices was accompanied by a drought (at least in 2001), their livelihoods were doubly threatened (Varangis et al. 2003).

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[61] Of course, for seasonal variation to be driving the difference between coffee and non-coffee areas, there would also need to be different patterns of seasonal variation between the groups.

[62] Unlike the other regressions reported in Table 9, the height-for-age z-score specification is not estimated using household-level fixed effects because the sample for which there is a child between the age of 6 and 48 months from the same household measured in both 2000 and 2002 is too small for precise estimation.

[63] Varangis et al. (2003) estimate that 90 percent of producers in Nicaragua produce less than 100 quintals.

Varangis et al. (2003) outline a variety of possible responses to the decline in prices, ranging from price risk management instruments (see McCarthy and Sun 2003 for a discussion of these in Honduras) to food-for-work programs. They call for improving social safety net programs, of which RPS is one example, making this analysis complementary to theirs. One recently begun Nicaraguan program they describe is *Plan Café*, which aims to help both large producers and laborers alike. Participants are employed on private coffee farms and are paid in part by the farm owners and in part by the government, in the form of food. Unfortunately, the RPS evaluation data analyzed in this paper were collected before this program was widely implemented so an assessment of its effects is not possible here. The results presented below should be interpreted as what happens in the absence of a governmental response.

In Section 2, I described the average effects of RPS on a variety of outcomes. In this section, I demonstrate that RPS has had greater average impacts in coffee growing versus non-coffee producing regions, for many indicators. Of course, this is not surprising since there was more "potential" for the program to have impact where the situation was worse or deteriorating more rapidly. This is similar in spirit to the general finding in the overall RPS evaluation that double difference estimated average impacts tend to be larger among the poorer groups in the sample, where there was often more potential, for example due to lower enrollment rates among the extreme poor (Maluccio and Flores 2004).

In both years, the program positively and significantly improved per capita total annual household expenditures and per capita household food expenditures. Across all program areas, RPS increased these expenditure measures by nearly 20 percent on average (see Table 10). In 2001, the program effect in coffee producing areas was substantially larger than in non-coffee areas. This differential, however, was substantially smaller in 2002 where, again, the program had a significant impact on expenditures though it was not significantly larger in coffee versus non-coffee growing areas. As I argue below, this may reflect increased labor effort between 2001 and 2002 by non-program recipients in coffee growing areas.

Table 10: The effect of Nicaraguan RPS on expenditures and labor force participation, 2000–2002

	Ln per capita real annual expenditures	Ln per capita real annual food expenditures	Total hours worked last week	Avg hours per worker worked last week
Year 2001	-0.0928 ***	-0.1324 ***	-0.1701	-0.0088
	(2.92)	(3.57)	(0.07)	(0.01)
Year 2002	-0.1053 ***	-0.1661 ***	-3.6031	-1.7101 ***
	(3.31)	(4.48)	(1.45)	(2.85)
Year 2001 × coffee	-0.2208 ***	-0.2626 ***	5.0476	3.2377 ***
	(4.59)	(4.69)	(1.35)	(3.57)
Year 2002 × coffee	-0.1629 ***	-0.1531 ***	21.8415 ***	6.4331 ***
	(3.39)	(2.73)	(5.82)	(7.09)
Year 2001 × RPS area	0.1816 ***	0.2781 ***	-3.9191	-0.4825
	(4.02)	(5.28)	(1.11)	(0.57)
Year 2002 × RPS area	0.1749 ***	0.2618 ***	0.3406	0.7732
	(3.97)	(4.97)	(0.10)	(0.91)
Year 2001 × coffee × RPS area	0.2789 ***	0.2553 ***	-13.0845 **	–4.2388 ***
	(4.14)	(3.25)	(2.49)	(3.33)
Year 2002 × coffee × RPS area	0.0657	0.0561	-23.4683 ***	–5.2571 ***
	(0.97)	(0.71)	(4.46)	(4.13)
Constant	8.0599 ***	7.6714 ***	81.9047 ***	25.2518 ***
	(679.85)	(555.47)	(88.56)	(112.87)
F-test Year 2001 + Year 2001 × coffee	84.58 ***	83.61 ***	18.95 ***	24.97 ***
	[<0.01]	[<0.01]	[<0.01]	[<0.01]
Joint test year 2002 + Year 2002 × coffee	23.99 ***	29.71 ***	35.06 ***	22.52 ***
	[<0.01]	[<0.01]	[<0.01]	[<0.01]
F-test overall regression	17.31 ***	19.19 ***	8.88 ***	8.97 ***
	[<0.01]	[<0.01]	[<0.01]	[<0.01]
Number of observations	4188	4188	4188	4188

See notes to Table 8.

Overall, the program had little significant effect on either total number of hours worked last week or hours worked per worker, but within coffee growing areas it had a negative effect on both.[64] These effects were larger in 2002 than in 2001, possibly explaining the weaker program effect on expenditures in that year as households without the program worked harder to make up for lost consumption. The estimated effects are driven largely by male labor which comprises about 90 percent of the total reported labor; excluding women does not change the findings and estimating the relationship for women alone leads to similar conclusions. The negative estimated impact on labor

[64] The program also did not affect the number of adult household members. Notice that unlike the discussion earlier regarding a concern that the timing of the survey may affect changes across rounds, the double (and in this case triple) difference estimator controls for this possibility so it is not a concern here.

supply does not, however, reflect a large decline in labor supply for program beneficiaries, which dropped about 8 hours per week in 2001 but only 2 hours a week in 2002, but rather reflects the substantial increase in hours worked by their coffee region counterparts who are not beneficiaries. In the absence of the program, then, beneficiary households in coffee producing regions would have had to devote substantially more time to work (and at the same time would have suffered declines in per capita expenditures).

In a separate section of the questionnaire, households report on remittances received over the past year. In regressions similar to those in Table 10 (but not shown), where the dependent variable is an indicator of whether a household received remittances in the past year (or the amount of remittances received), I find that RPS had a negative effect on the probability a household received remittances in 2001—but only in non-coffee growing areas. In coffee-growing areas, which underwent a more severe decline over the period, the program had no significant effect on receipt of remittances.

Despite coming with conditionality that may substantially increase private costs to households,[65] RPS transfers likely relax beneficiaries' budget constraints allowing them to re-optimize and thereby improve both their current and future situations. Given the long-term downward trend in coffee prices, one would be hard pressed to argue for entry in the industry and we might expect to see exit (if, indeed it has not already begun) over the medium to long term, fixed costs for coffee production notwithstanding. If, for example, households are credit constrained, they may not be able to reallocate their activities immediately, and so remain in coffee. It is possible that the access to additional resources provided by RPS allow this credit constraint to be broken and, in addition to changes in hours worked we would see changes in the type of work being carried out.

A separate credit constraint pathway via which RPS may work is posited in Coady, Olinto, and Cáldes (2003). Presenting a simple two period model for small coffee farmers, they demonstrate how unconditional transfers can have a direct income effect on labor supply (for all households) but also an indirect effect for credit constrained coffee farmers who, instead of having to seek off-farm labor are able to devote more time to maintaining their coffee trees, thereby raising the marginal productivity of their coffee land. That the transfers are conditioned on child attendance at school introduces a third effect, substitution between child and adult labor. If these are the underlying mechanisms, in contrast to the argument in the previous paragraph, one would see more labor devoted to coffee, rather than less.

In the baseline 2000, fully three-quarters of the households (in both coffee and non-coffee growing areas alike) indicated that they were credit constrained in the sense that either they had requested a loan (from either formal or informal sources) but not received it or that they had not requested a loan but did not do so because they felt they would not receive it. Because of the predominance of credit-constrained households, I do not report results distinguishing program effects between whether a household was credit constrained or not before the program, noting that any time invariant components of differences between these types of households is already controlled for in the analysis. When I do consider to what extent results differ for credit-constrained versus credit-unconstrained households, I find that most effects tend to be slightly larger for credit-constrained households, but not significantly so.

I now examine the types of work households carry out with and without the program to see if in addition to changes in total hours, the program induces adjustments along other dimensions of labor

[65] Caldés and Maluccio (2004) provide some estimates of private costs for beneficiary women of around 40 hours per year and C$ 40 in additional transportation costs.

supply. The results are presented in Table 11. In the first column, I assess the impact on total hours dedicated to agriculture in the last week—RPS reduced the total number of hours dedicated to agriculture on average for coffee producing areas, by around 10 hours a week. Nonetheless, despite these large declines, when I consider the fraction of labor hours in the household dedicated to agriculture, the RPS effect was negative for households in non-coffee growing areas in 2001, but positive for households in coffee growing areas in 2002. (Clearly, the effect of RPS on total hours was also negative and larger than that on agricultural hours alone, in coffee growing areas.) The evidence for small business participation is consistent with these patterns—program beneficiaries in coffee growing *comarcas* are less likely to be undertaking small business activities than their counterparts in non-beneficiary *comarcas*.

Table 11: The effect of Nicaraguan RPS on occupational choice, 2000–2002

	Total hours dedicated to agriculture last week	Fraction of labor allocated to agriculture last week	(1) if small business activity last week	(1) if regular small business activity
Year 2001	1.3119	0.04389 ***	-0.2113 ***	0.0515 ***
	(0.58)	(2.60)	(7.62)	(2.60)
Year 2002	4.3686 **	0.1026 ***	-0.2010 ***	-0.0309
	(1.95)	(6.07)	(7.25)	(1.56)
Year 2001 × coffee	2.1848	-0.0245	0.1352 ***	-0.0085
	(0.64)	(0.96)	(3.22)	(0.28)
Year 2002 × coffee	7.8036 **	-0.1194 ***	0.1348 ***	0.0674 **
	(2.30)	(4.69)	(3.21)	(2.25)
Year 2001 × RPS area	-2.1229	-0.0053	0.1011 ***	-0.0568 **
	(0.67)	(0.22)	(2.57)	(2.02)
Year 2002 × RPS area	-4.0562	-0.0633 ***	0.0619	0.0021
	(1.27)	(2.63)	(1.57)	(0.07)
Year 2001 × coffee × RPS area	-11.5277 **	-0.0297	-0.1665 ***	–0.0663
	(2.42)	(0.82)	(2.83)	(1.58)
Year 2002 × coffee × RPS area	-9.6113 **	0.1208 ***	-0.0972 *	–0.1339 ***
	(2.02)	(3.36)	(1.65)	(3.18)
Constant	65.1655 ***	0.8094 ***	0.1841 ***	0.1218 ***
	(77.90)	(128.28)	(17.80)	(16.47)
F-test Year 2001 + Year 2001 × coffee	14.93 ***	1.70	2.24	15.53 ***
	[<0.01]	[0.19]	[0.13]	[<0.01]
Joint test year 2002 + Year 2002 × coffee	14.97 ***	4.66 **	0.65	17.82 ***
	[<0.01]	[0.03]	[0.42]	[<0.01]
F-test overall regression	6.07 ***	7.16 ***	16.42	5.83 ***
	[<0.01]	[<0.01]	[<0.01]	[<0.01]
Number of observations	4188	4188	4188	4188

See notes to Table 8.

If staying in agriculture were equivalent to staying in coffee, this evidence would suggest that households in coffee-growing beneficiary *comarcas* may actually be intensifying their involvement in coffee and may not be making the "correct" adjustments based on world coffee market trends. Alternatively, it may reflect how in breaking the credit constraint, coffee producing households are able to invest more labor in their coffee related activities (before the harvest) to improve returns, as posited by Coady, Olinto, and Caldés (2003). This latter possibility seems less likely in this context, however, given the relatively small percentage of coffee producers reported in the sample. To more directly explore these hypotheses, I consider evidence on transitions into and out of coffee in the following section.

When I consider program effects dividing the sample as in section 4.1 by predicted poverty and, separately, land ownership, on the whole the findings above are unchanged though, as in the impact evaluation, nearly all of the effects were larger in magnitude for poorer households (though rarely significantly so). An exception occurs when I consider total and food expenditures and categorize by land ownership. For these outcomes, estimated effects in coffee-growing areas are larger for those with more than one hectare of land; this is consistent with the possibility that some of these households cultivate coffee and were more severely affected by the downturn.

In section 4.1 above, we saw that changes in primary enrollment and child labor also varied according to whether the child lives in a coffee or non-coffee growing area. Unsurprisingly, then, we also find differences in RPS effects across the two types, as shown in Table 12. Program effects on enrollment rates of girls age 7–12 were negligible in non-coffee growing areas but quite substantial, more than 20 percentage points, in coffee growing areas. This reflects the large gap between coffee and non-coffee growing areas that existed before the program (and still exists in the control group). With the combination of the transfers and the conditionality, RPS has essentially equalized enrollment rates for this group across the areas. For boys, the effect was more evenly spread among coffee and non-coffee growing areas and only in 2001 were they significantly larger in the latter areas. When I consider current attendance in school (defined as having missed fewer than 6 days in the previous two months of school) in results not shown, the pattern for girls is the same but for boys there are significant effects in non-coffee growing areas that are substantially larger in coffee-growing areas.

Consistent with the large increase in enrollment (though not necessary, since simultaneously working and attending school is common), RPS had a substantial negative effect on girls ages 7–12 working in the last week, but only in coffee growing areas. There were no significant program effects on boys in this age group, though all the estimated coefficients were negative. Overall, RPS did have significant negative effects on the incidence of child labor for boys; these insignificant effects are likely the result of splitting the sample into coffee and non-coffee households and also reflect the fact that schooling and work are not mutually exclusive. When I consider separately poor and non-poor households, it turns out that as discussed earlier, the larger effects are concentrated among the poorer households (regardless of classification method).

Finally, the effect on child height-for-age z-scores seems to be less positive in coffee growing areas (net positive effect of 0.12 compared with 0.36 in non-coffee growing areas) and is not significant, though this may also be in part due to the smaller sample sizes being considered.

Table 12: Primary enrollment, child labor, and child nutritional status in the control group, 2000–2002

	(1) if 7–12 year old enrolled: GIRLS	(1) if 7–12 year old enrolled: BOYS	(1) if 7–12 year old working: GIRLS	(1) if 7–12 year old working: BOYS	HAZ children 6–48 months of age
Year 2001	-0.0141	-0.0269	-0.0054	-0.0701 **	
	(0.52)	(0.97)	(0.30)	(2.51)	
Year 2002	0.0403	0.0117	-0.0395 **	-0.0691 **	-0.0383
	(1.43)	(0.40)	(2.08)	(2.35)	(0.42)
Year 2001 × coffee	0.0835 **	0.1083 ***	-0.0025	0.0452	
	(2.10)	(2.72)	(0.09)	(1.13)	
Year 2002 × coffee	0.0332	0.0581	0.0007	-0.0118	-0.1625
	(0.80)	(1.40)	(0.02)	(0.28)	(1.38)
Year 2001 × RPS area	0.0079	0.0716 *	-0.0077	-0.0415	
	(0.19)	(1.68)	(0.27)	(0.97)	
Year 2002 × RPS area	0.0148	0.1454 ***	0.0553 *	-0.0175	0.3575 ***
	(0.34)	(3.32)	(1.89)	(0.40)	(3.05)
Year 2001 × coffee × RPS area	0.2463 ***	0.1011 *	-0.0837 **	-0.0836	
	(4.18)	(1.72)	(2.10)	(1.41)	
Year 2002 × coffee × RPS area	0.2336 ***	0.0557	-0.1061 ***	-0.0469	-0.2408
	(3.82)	(0.91)	(2.57)	(0.76)	(1.43)
Age in years (months in final column)	0.0136 ***	0.0157 ***	0.0178 ***	0.0573 ***	-0.0087 ***
	(2.76)	(3.21)	(5.35)	(11.62)	(3.62)
(1) if male	n/a	n/a	n/a	n/a	0.0450
					(0.77)
Constant	0.6603 ***	0.6155 ***	-0.1036 ***	-0.3415 ***	-1.5285 ***
	(14.72)	(13.68)	(3.42)	(7.54)	(18.51)
F-test Year 2001 + Year 2001 × coffee	57.43 ***	23.22 ***	8.57 ***	0.77	
	[<0.01]	[<0.01]	[<0.01]	[0.38]	
Joint test year 2002 +Year 2002 ×coffee	35.12 ***	6.38 ***	12.01 ***	1.68	0.95
	[<0.01]	[0.01]	[<0.01]	[0.20]	[0.33]
F-test overall regression	20.89 ***	18.56 ***	6.35 ***	18.12 ***	5.58 ***
	[<0.01]	[<0.01]	[<0.01]	[<0.01]	[<0.01]
Number of observations	2359	2430	2359	2430	1493

Notes: Household-level fixed-effects estimation in control group only for first four columns; ordinary least squares estimation with robust standard errors allowing for heteroskedasticity in the final column (Stata Corporation 2001). T-statistics reported in parentheses and p-values in brackets. * indicates significance at 10%, ** indicates significance at 5%, and *** indicates significance at 1%.

4.3. Transitions into and out of the coffee sector

I next consider whether and how RPS influenced the extent to which households were moving in and out of the coffee "industry," using the available, albeit imperfect, individual-level information regarding what persons did as their main activity in the last week described in Section 3.3. Table 13 presents results from regressions in which the dependent variable is an indicator of whether anyone in the household indicated they worked in the coffee sector in the last week (first column), whether the participation was as a laborer (second column), or whether the participation was as a producer. In the first column, while it is clear that participation was lower in 2001 and 2002 relative to 2000 (in coffee growing areas), there does not seem to have been any effect of RPS on household participation in the coffee sector. When we split participation into those participating as laborers and those participating as producers, however, it appears that program effects are significant—but have opposite effects on laborers and producers. The program decreases participation as coffee laborers but has a positive effect on participation as producers. Since, on average, there were fewer producers in 2002 than in 2000, what these effects mean is that beneficiary households were more likely to remain as coffee producers than their counterparts without the program (though recall that participation is only a small percentage and that these data must be treated carefully).

Table 13: The effect of Nicaraguan RPS on participation in the coffee sector at the household level, 2000–2002

	(1) if any participation in coffee sector	(1) if laborer participation in coffee sector	(1) if producer participation in coffee sector
Year 2001	-0.0103	-0.0103	-0.0026
	(0.56)	(0.58)	(0.29)
Year 2002	-0.0129	-0.0129	-0.0026
	(0.71)	(0.73)	(0.29)
Year 2001 × coffee	-0.0592 **	-0.0327	-0.0438 ***
	(2.15)	(1.22)	(3.25)
Year 2002 × coffee	-0.0732 ***	-0.0700 ***	-0.0305 **
	(2.65)	(2.61)	(2.27)
Year 2001 × RPS area	0.0051	0.0051	0.0026
	(0.19)	(0.20)	(0.20)
Year 2002 × RPS area	-0.0081	-0.0055	-0.0001
	(0.31)	(0.22)	(0.00)
Year 2001 × coffee × RPS area	-0.0463	-0.0666 *	0.0315 *
	(1.20)	(1.77)	(1.66)
Year 2002 × coffee × RPS area	-0.0043	-0.0225	0.0239
	(0.11)	(0.60)	(1.27)
Constant	0.1447 ***	0.1297 ***	0.0301
	(21.25)	(19.62)	(9.05)
F-test Year 2001 + Year 2001 × coffee	2.06	4.87 **	5.88 **
	[0.15]	[0.03]	[0.02]
Joint test year 2002 + Year 2002 × coffee	0.18	1.01	2.89 *
	[0.67]	[0.32]	[0.09]
F-test overall regression	7.31 ***	7.50 ***	3.03 ***
	[<0.01]	[<0.01]	[<0.01]
Number of observations	4188	4188	4188

See notes to Table 8.

Program beneficiaries in coffee growing areas appear to be less likely to have been working in coffee as laborers but more likely as producers. Taken together with the results on the share of work in agriculture, it suggests that those households who are not coffee producers are intensifying activity in other agricultural activities, including maize and bean cropping, though it is not possible at this point to say which ones. The findings are also consistent with the existence of credit constraints inhibiting such transitions, to the extent that agricultural activities require start up investments and do not yield returns for some time—in contrast to some of the non-agricultural activities are more likely yielding immediate returns. Furthermore, if the beneficiary households are optimizing then it suggests returns to non-coffee agricultural activities are higher than both coffee and the available non-agricultural activities in coffee growing regions. For those households that are coffee producers, it would appear that RPS is serving as a risk coping mechanism during the crisis, allowing them not to exit (in comparison to their counterparts in coffee-growing areas without the program), consistent with the results from Coady, Olinto, and Caldés (2003).

4.4. Role of RPS in mitigating effects of idiosyncratic "shocks"

Although the experience of each household during a general economic downturn clearly differs, an important feature of the preceding analysis has been that it has considered the effect of a widespread downturn potentially affecting all households. Borrowing from the language on economic shocks, this would be considered a covariate event. Social safety net programs have an important role to play in such situations because it may be more difficult for households to utilize other (informal) safety nets, for example networks of reciprocity among neighbor households, if they are being strained by the same set of circumstances. Another likely role for RPS, however, is in coping with household specific "crises" or idiosyncratic shocks. Of course, it is not the case that the program must necessarily help with coping because some shocks may require a response that jeopardizes participation in the program, for example if the conditionality becomes to burdensome.

In this section, I examine whether households with RPS were better able to cope with two types of negative economic shocks reported on in the survey, including flooding and theft. I choose these two events because it is plausible that they are largely exogenous to household behavior, particularly after controlling for household fixed effects. Five percent of households reported a shock of this sort between the 2000 and 2001 surveys, and nine percent between 2001 and 2002 (in both years about ¼ of the reported shocks were theft). The number of shocks reported in intervention and control areas was about the same. Table 14 presents results for two of the outcomes considered in Table 8, including an indicator of whether one or both of the events described occurred in the previous year, as well as an interaction term between the event indicator and whether the household resided in an intervention *comarca*. Results are similar when controls for coffee and non-coffee growing regions are included so I only present the combined results.

Shock information was only collected in the follow-up surveys in 2001 and 2002; as a result, there are two obvious ways to model the relationship between shocks and these outcomes. The first is to consider only those two years of data and look at the contemporaneous effect. The shock information, however, pertains to the previous 12 months and as such another way to examine it is estimate a difference equation including indicators for shocks in the period in which they occurred, i.e., take the difference of expenditures between 2001 and 2000 and include on the right hand side an indicator of shocks reported in 2001, but relating to the previous 12 months. This difference equation is in effect a household-level fixed-effects relationship (because of the differencing) and is shown in the first and third columns. One can also estimate the difference equation including household fixed effects in that relationship as well; effectively this controls for

household fixed effects in the growth of the dependent variable over the two years.[66] For example, when considering expenditures, the typical household fixed effect controls for factors associated with the level of expenditures but in this formulation it controls for that type of fixed effect, as well as any unobserved fixed heterogeneity in the *growth* of expenditures.

For the logarithmic per capita total expenditure outcomes, the indicator for reporting a shock has estimated coefficients that are small and negative, but in no case are they significantly different from zero.[67] It would appear that households without the program were able to protect themselves from the negative effects of these events, possibly via informal insurance mechanisms, or that the reported shocks were not very severe. For households who suffered the same shocks but had RPS, there is a positive interaction with the program, statistically significant in the first specification and nearly significant in the difference specification with household fixed effects. Rather than merely enabling households to offset losses from the shocks and thereby smooth consumption (relative to those in the control group), RPS beneficiaries who suffered these types of shocks substantially increased expenditures relative to their counterparts without the program. This effect is exacerbated when we consider only those who reported a theft—consistent with their increasing expenditures in order to replace items lost.

Table 14: The effect of Nicaraguan RPS on expenditures and labor force participation with idiosyncratic shocks, 2000–2002

	Ln per capita real annual expenditures	Ln per capita real annual expenditures	Avg hours per worker worked last week	Avg hours per worker worked last week
	Difference equation	Difference equation, HH FE	Difference equation	Difference equation, HH FE
Period 2001–2002	0.0608 **	0.20356 ***	-0.8646	-2.1016 **
	(2.03)	(4.94)	(1.50)	(2.56)
Period 2001–2002 × RPS area	-0.1235 ***	-0.4090 ***	1.3333 **	3.6662 ***
	(3.54)	(7.12)	(1.99)	(3.20)
(1) if shock reported during year	-0.0587	-0.0160	3.1270 ***	5.0865 **
	(0.94)	(0.16)	(2.61)	(2.48)
(1) if shock reported during year × RPS area	0.2881 ***	0.2406	-4.4061 ***	–8.3696 ***
	(3.19)	(1.56)	(2.53)	(2.73)
Constant	-0.0409 **	-0.0417 **	0.1858	0.2040
	(2.40)	(2.03)	(0.57)	(0.50)
F-test overall regression	5.40 ***	13.56 ***	2.42 **	4.08
	[<0.01]	[<0.01]	[0.05]	[<0.01]
Number of observations	2792	2792	2792	2792

See notes to Table 8.

Examining labor force participation, Table 14 shows the effect of these shocks on average hours worked per worker. Here the difference equations show that the occurrence of a shock in the

[66] Six households reported shocks in both years so that these are effectively removed from the estimation since the household fixed effect perfectly predicts their outcome.

[67] While I do not focus on the "program effects" on growth in per capita expenditures or describe them in the text, it is not surprising that the program effect on the growth rate between periods 2000–2001 and 2001–2002 is negative (as shown by the coefficient on the interaction of period 2001–2002 and RPS intervention area) since during the latter period the growth in the intervention group expenditures was slight after large gains in 2000–2001.

household led to increased labor effort per worker (and similarly at the household level not shown, though the effects are more muted). This is a striking result since it occurs despite the fact that while the shocks may have occurred at any time over the last year, labor force effort is only measured over the last week. Households living in the intervention areas, however, decreased their labor effort more than enough to offset their counterparts increased labor supply. When faced with negative events, households with the program appear to rely heavily on it, more freely spending the transfers and cutting back on labor supply.

In addition to information on these economic events, households were asked whether they undertook a variety of coping strategies in response to the event. Overall, more households without RPS reported doing nothing in response to the event, but among those who did they were more likely to have taken a loan, failed to pay back a loan, spent savings, or sold off assets. Households with the program, on the other hand, were more likely to have received help from family or friends, as well as from NGO's or government programs, though the latter may have included RPS.

4.5. Robustness of the results

As described at the beginning of this section, the above results are estimated using the balanced panel household sample of 1,396 households and controlling for household fixed effects. In this section I consider whether the results change when I account for some statistical concerns for these data.

If one is willing to ignore the household fixed effects, we can more conservatively estimate the standard errors to better control for heteroskedasticity and *comarca*-level clustering. Doing this by estimating robust standard errors allowing for clustering (Stata Corporation 2001) changes the estimated effects very little on the whole, but does increase the estimated standard errors, thereby reducing significance. Nonetheless, none of the substantive findings change. Above I also ignored the stratified sample design, which can be corrected for statistically using sample weights; correcting for this aspect of the design also requires that we ignore the household fixed effects. As above, the results change very little.

While the household-level fixed-effects approach controls for attrition biases associated with fixed household characteristics, attrition is still a concern since it is possibly related to time-varying factors that may also be directly related to the outcomes being considered. While I do not implement an attrition selection correction procedure, as an additional check that attrition is not leading to severely biased results I re-estimate the above analyses using the unbalanced sample, and find no substantive differences in the findings. Recall that the number of households is about evenly divided between intervention and control groups, suggesting that attrition was not significantly different between intervention and control groups. I therefore conclude that attrition bias is not driving the results presented here.

When I re-estimate all the results excluding comarcas from the department of Madriz (where coffee is not grown), the results are similar in magnitude throughout—though at times no longer significant because of the loss of power in reducing the sample size by about one-third. Finally, when controls are included for the severity of the drought (which did vary across the sample even though nearly all *comarcas* reported having been effected by the drought), little changes—this is likely due to the fact that the fixed effects already control for much of the potential bias associated with drought. The effects of the drought are not being conflated with those due to the downturn in coffee prices.

5. CONCLUSIONS

A major cause of the intergenerational transmission of poverty is the inability of poor households to invest in the human capital of their children. Supply-side interventions, which increase the availability and quality of health and education services, are often ineffective in resolving this problem since the resource constraints facing poor households preclude them from shouldering the private costs associated with utilizing these services (e.g., travel costs and the opportunity cost of women's and children's time). Innovative programs like RPS attack this problem by targeting transfers to the poorest communities and households, and by conditioning these transfers on attendance at school and health clinics. This effectively transforms pure transfers into human capital subsidies for poor households. An evaluation of the Nicaraguan RPS has shown that this approach was largely successful against its primary objectives of supplementing income to increase expenditures on food, improving school matriculation, and improving child health care.

The international and local Nicaraguan media have widely reported about the "coffee crisis" in Central America. While this crisis should probably not be considered a surprise and so to a certain extent the estimates presented in this paper represent lower bounds, the evidence shows that there has been a downturn in Nicaragua over the period and that this has been more severe in the coffee growing regions of RPS. In coffee growing areas, per capita expenditures declined by ten percent over the 2000–2002 period and by more than twice that in coffee growing areas. Nutritional status of children ages 6–48 months also deteriorated over the period. Educational outcomes and child labor, however, did not worsen; possibly reflecting decreased rural labor demand. Households responded to the crisis in part by increasing labor supply.

As a result, RPS had generally larger effects in coffee growing areas than in non-coffee growing areas. While not designed as a safety net program in the sense of reacting to crises or shocks, RPS has performed more like such a traditional safety net program, protecting more those who were most affected by the downturn. For example, it provided a cushion for per capita expenditures enabling beneficiary households to maintain pre-program expenditure levels in both coffee and non-coffee growing areas. Given the differences in the severity of the crisis across the areas, this means that the program had substantially larger estimated effects in coffee growing areas. It also protected, and promoted, investment in child human capital (as indicated by increased enrollment rates, decreased child labor, and improved height-for-age z-scores). The co-responsibilities were not abandoned, showing that conditional cash transfer programs can be effective, even during a downturn. Overall, the program had little significant effect on either total number of hours worked last week or hours worked per worker, but within coffee growing areas it had a negative effect on both. While not depressing labor supply relative to before the program, RPS also seems to have muted additional labor effort for beneficiaries in coffee growing areas (relative to their counterparts without the program).

The evidence is more mixed, however, as to whether and how RPS enabled households to reallocate their resources in a fashion consistent with the broader trends in coffee prices—in part because of data limitations. RPS reduced the total number of hours dedicated to agriculture on average for coffee producing areas, but despite this decline these same households increased the proportion of their total labor supply dedicated to agriculture. The findings for small business participation are consistent with these patterns—program beneficiaries in coffee growing *comarcas* are less likely to be undertaking small business activities than their counterparts in non-beneficiary *comarcas*.

If staying in agriculture were equivalent to staying in coffee, this evidence would suggest that households in coffee-growing beneficiary *comarcas* may actually be intensifying their involvement in coffee and may not be making the "correct" adjustments based on world coffee market trends. To more directly explore these hypotheses, I then presented evidence on transitions into and out of coffee: beneficiaries who participated in coffee as laborers, were more likely to be exiting (or at least working less in) the coffee industry, whereas those who participated as producers were less likely to be exiting.

Taken together with the results on the share of work in agriculture, these results suggest that those households who are not coffee producers are intensifying activity in other agricultural activities, though it is not possible to say which ones. The findings are also consistent with the existence of credit constraints inhibiting such transitions in the absence of the program, to the extent that agricultural activities require start up investments and do not yield returns for some time—in contrast to some of the non-agricultural activities that are more likely to yield immediate returns. On the other hand, for those households that are coffee producers, it would appear that RPS is serving as a risk coping mechanism during the crisis, allowing them maintain their coffee land and trees. Overall, then, RPS appears to be playing an important part in the "risk" coping strategies of households, a conclusion also supported by the separate analysis of individual household-level idiosyncratic shocks.

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ANALYSIS OF THE POVERTY AND SOCIAL IMPACTS OF THE COFFEE CRISIS (PRICE SHOCK) in El Salvador

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FUSADES
El Salvador

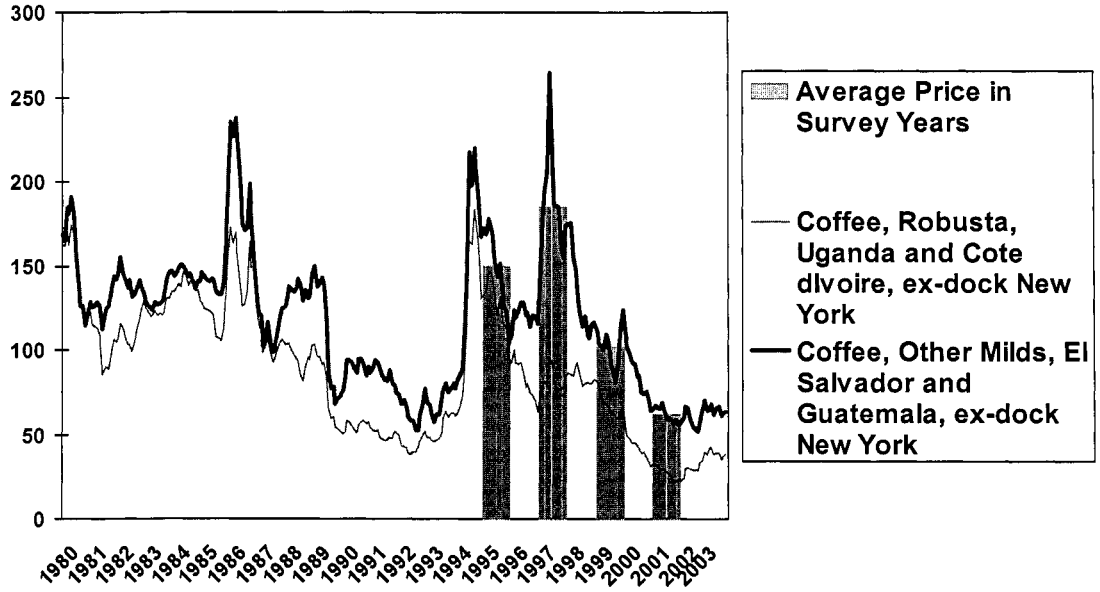
CONTENTS

Analysis of the Poverty and Social Impacts of the Coffee Crisis (Price Shock) in El Salvador[68]

Background

According to *Consejo Salvadoreño del Café* (Salvadoran Coffee Council) employment in coffee production fell from 185,630 individuals in 2000 to only 58,800 in 2003.[69] Coffee used to be the main export crop of El Salvador, and today is still important in some regions of the country, generating employment and income for several thousand families. But in a context of a declining share of agricultural activities in El Salvador's economy,[70] the coffee crisis deepens economic and social problems for rural households in the country. Using a common expression in El Salvador, for households depending on the coffee sector "it has rained on wet soil". Thus, the international coffee crisis is deepening the problems of an already weakened sector.

Figure 1: Coffee Prices in US$ Per Pound (January/1980-August/2003)



Source: IMF, http://www.imf.org/external/np/res/commod/index.asp.

[68] This paper has been prepared for FUSADES and the World Bank. We greatly acknowledge comments from Claudio Gonzalez-Vega, Andrew Mason, and Jorge Rodriguez-Meza. We also appreciate the support from the research team of FUSADES, especially Margarita Beneke de Sanfeliu, Anabella Lardé de Palomo and Mauricio Shi.

[69] La Prensa Gráfica, "Exportaciones de café vuelven a caer". August 9, 2003.

[70] See Tables 1 to 7 in statistical appendix.

Coffee prices for Salvadoran and Guatemalan coffee reached a peak on May, 1997, and since then prices have declined to one of the lowest values over the past 20 years, causing social and financial hardship for most households relying on this crop (Figure 1).[71] Average monthly price for years 1995, 1997, 1999 and 2001, which correspond to the years of the household surveys used in this research have therefore fallen; 1997 was a peak year, then, coffee prices fell sharply in 1999 and 2001. This paper is an effort to measure the effects of the coffee crisis in socio-economic well-being of rural households in El Salvador, to understand how they cope with the crisis, to assess at which level government intervention could mitigate the negative effects of the shock identifying policies and government programs that address poverty and social impacts of the coffee crisis affecting the poor and near poor in rural areas.

Description of the data set

For most of the analysis in this paper we employ the rural panel data set from a household survey collected by the Salvadoran Foundation for Economic and Social Development (FUSADES). The household survey was first carried out in 1996 in collaboration with the World Bank and was a principal input into the 1998 "El Salvador Rural Development Study" by the World Bank (1998). All survey questions refer to the 1995 calendar year. The survey was originally designed as a stratified random sample of 628 households aimed to be representative of the rural population at a 10 percent significance level. Additional interviews were carried out, as a supplemental sample, to enlarge the number of "land-using farmers". A total of 738 rural households were interviewed in 1996, 302 of which were chosen to be rural "land using farmers" that employed 0.5 or more manzanas of land and 428 "rural worker" households using less than this amount of land. A second round of interviews was conducted in 1998 and the third and fourth rounds in 2000 and 2002, with questions referring to the 1997, 1999 and 2001 calendar years respectively. From the pool of additional households in the 1995 round, in subsequent surveys substitute households were chosen to reduce attrition. It must be stressed that substitute households were also chosen from the population at large.

The latter three rounds were completed with funding from USAID's BASIS (Broadening Access and Strengthening Input Systems) research program and collaboration from The Ohio State University. A total of 623, 696 and 689 interviews were conducted in 1998, 2000 and 2002. Table 1 presents detailed information on the sample sizes for each year, the number of individuals covered, and the average household size. With a questionnaire modeled on the World Bank's Living Standards Measurement Survey (LSMS) the BASIS-FUSADES data set is the most comprehensive rural panel data set available for El Salvador, since it is possible to form panel data sets of the same households over two, three or four years. Also, for each household, the observational unit, we can obtain multiple observations in a specific year, in the sense that we have a mixture of individuals and households. This last property is exploited in the section about the probability of school attendance below to estimate a random effects Probit model where household members are clustered by household, in order to take into account household effects.

[71] For a detail analysis of the current situation and crisis in international coffee markets see Lewin and Giovannucci (2002).

Table 1: Sample size of the BASIS Rural Household Surveys in El Salvador

Year	Number of Households	Number of Individuals	Average Size
1995	738	4,349	5.89
1997	623	3,817	6.13
1999	696	4,140	5.95
2001	689	4,110	5.96
Panel 95/97	494	2,994	6.06
Panel 97/99	593	3,576	6.03
Panel 95/99	521	3,136	6.02
Panel 97/01	573	3,455	6.03
Panel 95/97/99	470	2,844	6.05
Panel 97/99/01	572	3,443	6.02
Panel 95/97/99/01	451	2,737	6.07

Source: BASIS Database.

Definition of Coffee Households and Regional Indicators of Coffee Activities

Defining which households are engaged in coffee related activities using the data set described above is not as easy at it seems because some of the questions in the surveys were not included in all years. The definition of coffee-households should include those households that dedicated some of their own land resources to the production of coffee, we call them *coffee growers*, as well as those households who have at least one member worker in the coffee sector as a wage earner either during the harvest (know in El Salvador as *la corta*) or in other activities related to the coffee crop, we call them *coffee workers*.

The first part of the definition is readily accessible in all questionnaires, except that the sample size is very small (see Table 2). Less than 7 percent of all households in the sample participate as coffee growers. Even though we are interested on the effects of all households related to coffee activities, we will also keep track of this particular group, since it allows to study the dynamics of social and economic variables, only as a complement with the rest of the analysis. A strong warning is made regarding the sample size and making inferences at the national level from this group should be avoided.

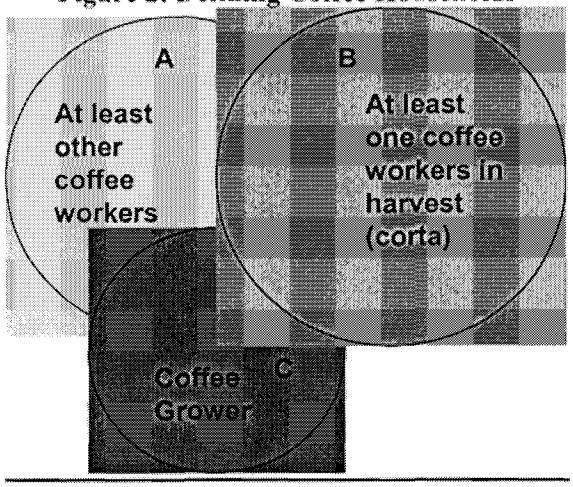
Table 2: Frequency and Percentage of Households Growing Coffee

Year	Complete Sample		
	Non-Coffee Growers	Coffee Growers	Total
1995	696	42	738
	94.3	5.7	100
1997	594	29	623
	95.4	4.7	100
1999	649	47	696
	93.3	6.8	100
2001	652	37	689
	94.6	5.4	100
Year	Four-year Panel Sample		
	Non-Coffee Growers	Coffee Growers	Total
1995	428	23	451
	94.9	5.1	100
1997	425	26	451
	94.2	5.8	100
1999	422	29	451
	93.6	6.4	100
2001	428	23	451
	94.9	5.1	100

Source: BASIS Database.

The second part of the definition presents some problems since the questionnaires do not have the necessary questions in all years. Figure 2 presents a diagram of the three conditions necessary to define coffee households. B is the set of households that have at least one member as a worker during the coffee harvest (corta), A is the set of households that have at least one member as another type of coffee workers, and C the set of households that are coffee growers as defined above. The complete definition of households with coffee workers entails A and B ($A \cup B$), however, in the surveys this information is available for 1997 as ($A \cup B$) only, without distinction between A and B. In 1995 is not possible to identify A nor B, and in 1999 and 2001 it is possible to identify B only.

Figure 2: Defining Coffee Households



Therefore, we adopt the clearest definition that could be obtained in the 1997 survey and use it as our base definition to assess the impact of the coffee crisis on household's welfare. That is, a coffee household is one that fall in either A, B or C category or any combination of them ($A \cup B \cup C$). The strategy is to compare how these households evolved compared to other households. For 1997, we can also classify households as: i) coffee growers; ii) coffee workers; iii) coffee workers and growers; and iv) non-coffee households. Both in 1999 and 2001 it is possible to identify which members of the household work as salaried workers, and who worked in the coffee harvest during the harvest season (corta, set B). However it is not possible to identify other types of engagement as salaried workers in the coffee sector such as permanent workers or work required in coffee plantations, such as trimming (set A). In that sense, with the available information, surveys on 1999 and 2001 do not identify the number of wage workers in the coffee sector, with the exception of those that participate in the coffee harvest or "la corta". In 1995 was not possible to identify which workers worked in the coffee sector, only those households dedicate to coffee production in their own land.

In 1997 approximately one quarter of rural households in El Salvador had members working as wage workers in the coffee sector, and approximately 4.6 percent of households had members engaged in self employed coffee activities in their own land. Overall, 28.4% of rural households were engaged in some kind of activity in the coffee sector. If we look at this percentage for the reduced samples that belong to the different panel data sets that are possible to construct, the percentage remains almost unchanged. Since the sample of self employed coffee households, or coffee growers is very small, for statistical purposes we will consider it to do a complementary analysis only. Given the problems with this definition we do not attempt to compare the number of households with wage workers in the coffee sector in 1997 with those of 1999 and 2001, which included only those involved in the coffee harvest. However, it is possible to see that between 1999 and 2001, where the definitions are comparable; there are not major changes in the percentage of households involved in the coffee sector (see Table 3).

Table 3: Proportion or rural households engaged on coffee related activities.

	Number of Households				Percent			
	COMPLETE SAMPLE							
TYPE	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	42*	19	27	19	5.7	3.0	3.9	2.8
Coffee workers		148	101	101		23.8	14.5	14.7
Coffee workers and growers		10	20	18		1.6	2.9	2.6
Else		446	548	551		71.6	78.7	80.0
Total	738	623	696	689	100	100.0	100.0	100.0
	1997-1999 PANEL							
TYPE	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers		17	22			2.9	3.7	
Coffee workers		139	93			23.4	15.7	
Coffee workers and growers		10	12			1.7	2.0	
Else		427	466			72.0	78.6	
Total		593	593			100.0	100.0	
	1999-2001 PANEL							
TYPE	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers			27	19			4.0	2.8
Coffee workers			97	97			14.4	14.4
Coffee workers and growers			19	18			2.8	2.7
Else			529	538			78.7	80.1
Total			672	672			100.0	100.0
	1997-2001 PANEL							
TYPE	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers		17		14		3.0		2.4
Coffee workers		136		87		23.7		15.2
Coffee workers and growers		10		14		1.7		2.4
Else		410		458		71.6		79.9
Total		573		573		100.0		100.0
	1995-1997-1999-2001 PANEL							
TYPE	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	23*	16	18	12		3.5	4.0	2.7
Coffee workers		99	65	63		22.0	14.4	14.0
Coffee workers and growers		10	11	11		2.2	2.4	2.4
Else		326	357	365		72.3	79.2	80.9
Total	451	451	451	451		100.0	100.0	100.0

*: All coffee growers

Source: BASIS surveys, 1997, 1999, 2001.

ALTERNATIVE REGIONAL INDICATORS OF COFFEE PRODUCTION

An alternative way of evaluating how the coffee crisis affected social and economic conditions of rural households in El Salvador is to use indicators of intensity of coffee activities at the regional level. We have identified two possibilities. First, to construct a regional categorical variable given the fact that coffee activities are concentrated in particular regions of the country. And second, to use available information at municipal level about the area of coffee plantations relative to the territorial extension of the municipality.

The construction of a categorical regional variable is based on the geographical division applied by DIGESTYC in the national Multipurpose Household Survey. The country is divided into four major regions (see **Table 4**). This possibility is feasible only for 1997 where coffee households can be defined. Using the sample for the panel including years 1995, 1997, 1999 and 2001,

Table 5 shows that regions *West* and *Central I* have considerable share of households engaged in coffee activities compared to the other two regions. We can call the share of household involved in coffee activities, *coffee household intensity*. Therefore, the regional categorical variable or the

percentage of coffee households in each region could be used as proxy variables that reflect the importance of coffee activities in the region.

Table 4: Geographical Division of El Salvador by Regions and Departments according to DIGESTYC

Region	Department
West	Ahuachapán Santa Ana Sonsonate
Central I	Chalatenango La Libertad San Salvador Cuscatlán
Central II	La Paz Cabañas San Vicente
East	Usulután San Miguel Morazán La Unión

As an alternative to household coffee intensity or the regional variables we also have information about the area of coffee growing at the municipal, departamental, and regional level. We can call this the *coffee area intensity*. The following table shows the information, confirming that the main coffee producing region by and large is the Western region of the country followed by the Central I region. Since both, coffee household and coffee area intensities show similar trends the use of the categorical regional variable could be a good proxy for coffee activities in the region. But also, given that the coffee area intensity is available at the local municipal level, it could be useful to test if the intensity of coffee activities at the local level has an extra effect of household's welfare, that is we could test the effects of coffee intensity at two levels of aggregation.

Table 5: Geographic concentration of the coffee households in 1997.

Regions	Non-Coffee	Coffee	Total
West	58	54	112
	51.79	48.21	100
Central I	97	41	138
	70.29	29.71	100
Central II	47	9	56
	83.93	16.07	100
East	124	21	145
	85.52	14.48	100
	326	125	451
Total	72.28	27.72	100

Source: BASIS survey, 1997. The sample used is for the 1995/1997/1999/2001 panel.

Table 6: Percentage of the total area of a region with coffee plantations

Region	Coffee Area	Area of Territory	Coffee Intensity
West	831.6954	4488.54	.1852931
Central I	390.1724	5312.4	.0734456
Central II	77.809	3512.14	.0221543
East	307.0406	7729.31	.0397242

Source: Own calculation using municipal-level data available from PROCAFE.

Coffee intensity and the BASIS/FUSADES surveys

Another way to verify if the information about coffee area intensity in the region is useful to analyze the effects of the coffee crisis in rural households is to find if it is a good predictor of the probability of a household being involved with the coffee sector in the BASIS/FUSADES surveys. As an approximation we use a simple probit model for the probability of a household involved in the coffee sector in 1997[72] and we obtain these results:

Probit estimates

Number of obs = 592 LR chi2(1) =132.90

Prob > chi2 =0.0000 Log likelihood = -284.80475

Pseudo R2 = 0.1892

COFFEE97	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
intensity	3.552645	.3299456	10.77	0.000	2.905964	4.199327
_cons	-1.107939	.0774568	-14.30	0.000	-1.259751	-.9561261

The variable "intensity" (=area in square kilometers of coffee plantation over area in square kilometers of the municipality) is a good predictor of the probability of a household being involved in coffee activities. We graph the predicted probability of working in the coffee sector against intensity in **Figure 3**. Both, the significant coefficient of the coffee-area-intensity variable and the graph show that this variable will be a good instrument in regression analysis.

Also, taking the subcategory of households that are coffee growers the coffee area intensity index is a good predictor of the probability of a household participating as coffee grower in the economy. Given that this subcategory is available independently for each of the four years of the panel, predicted probabilities could be estimated for each year. **Figure 4** shows that the probability that a household participating as coffee grower increases with the coffee area intensity index, but it also shows that the probabilities are lower for 1997 and 2001. Value Added of the coffee sector in El Salvador was smaller in 1997 and 2001, compared to 1995 and 1999 (see Table No. 1 in the statistical annex), suggesting that the survey is able to capture these

[72] The sample size in this regression includes only those households for which we were able to identify the municipality.

movements in coffee production in El Salvador, and that there is a tendency to move away from this sector.

Figure 3: Predicted Probability of a Household Involved in Coffee Activities as a Function of Coffee Area Intensity, 1997.

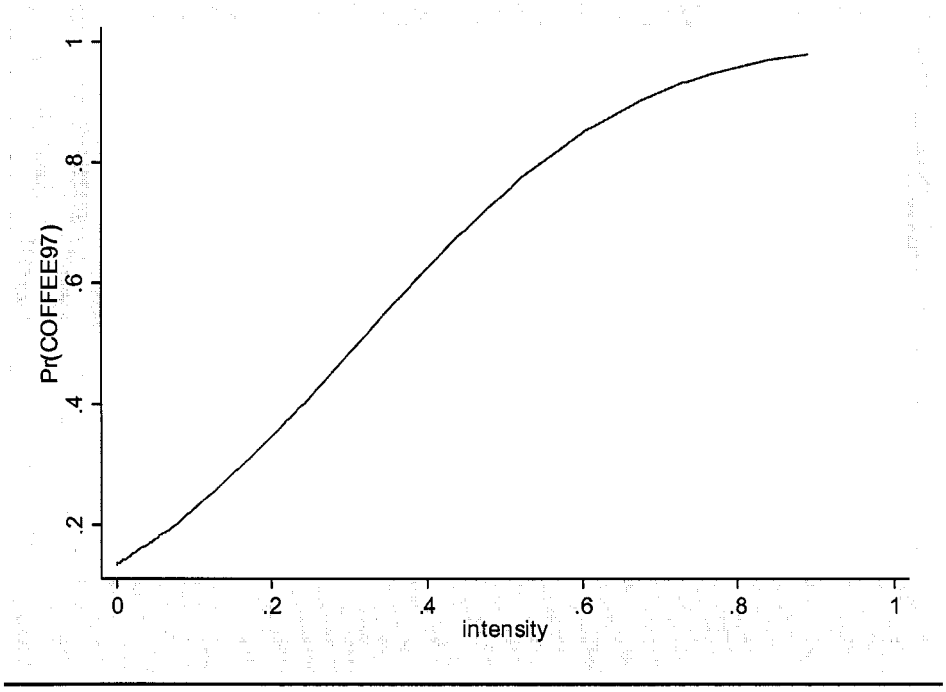
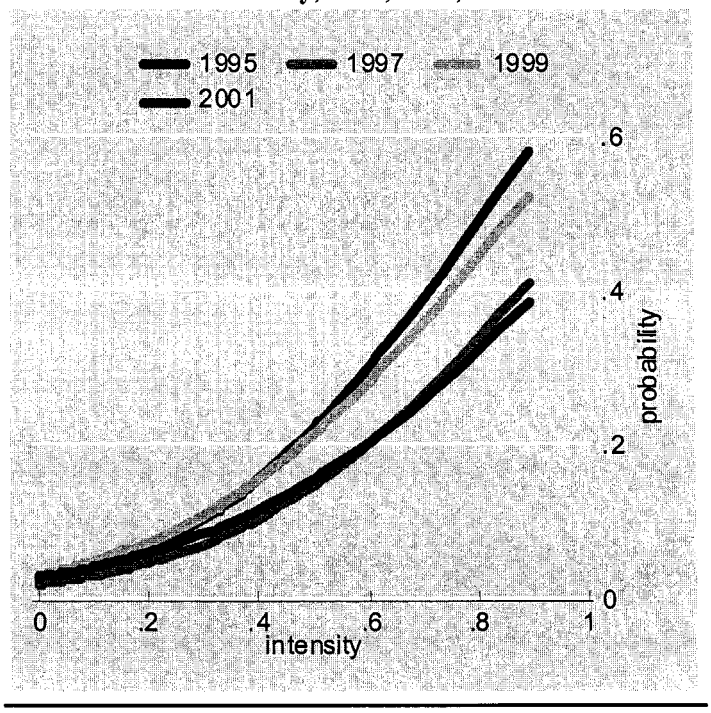


Figure 4: Predicted Probability of a Household Involved as Coffee Grower as a Function of Coffee Area Intensity, 1995, 1997, 1999 and 2001.



To see the movements in and out of coffee production for the category of coffee growers it is convenient to construct a transition probability matrix. The transition probability matrix describes the change of a categorical variable over time. A symmetric diagonal matrix with values equal to 100 in the diagonal indicates that households do not change categories over time; on the contrary the smaller values of the diagonal indicate more changes of categories over time. **Table 7** shows that from households in the panel data set, 5.76% participated as coffee growers on average over the four years covered by the survey (1995, 1997, 1999, and 2001). For coffee growers the probability of moving out of this activity is about one third. On the other hand, from those households that did not participate on coffee activities, there is only a two-percent probability of moving into the sector. This supports the idea that categorical mobility is very high for coffee growers.

Table 7: Transition Probability Matrix of Coffee Growers and Other Type of Households (years 1995, 1997, 1999, and 2001).

Household Type	Others	Coffee Growers	Total
Others	97.96	2.04	100.00
Coffee Growers	33.33	66.67	100.00
Total	94.24	5.76	100.00

Source: Own estimates using the complete panel sample of the BASIS/FUSADES surveys.

Coffee intensity and alternative measures of welfare

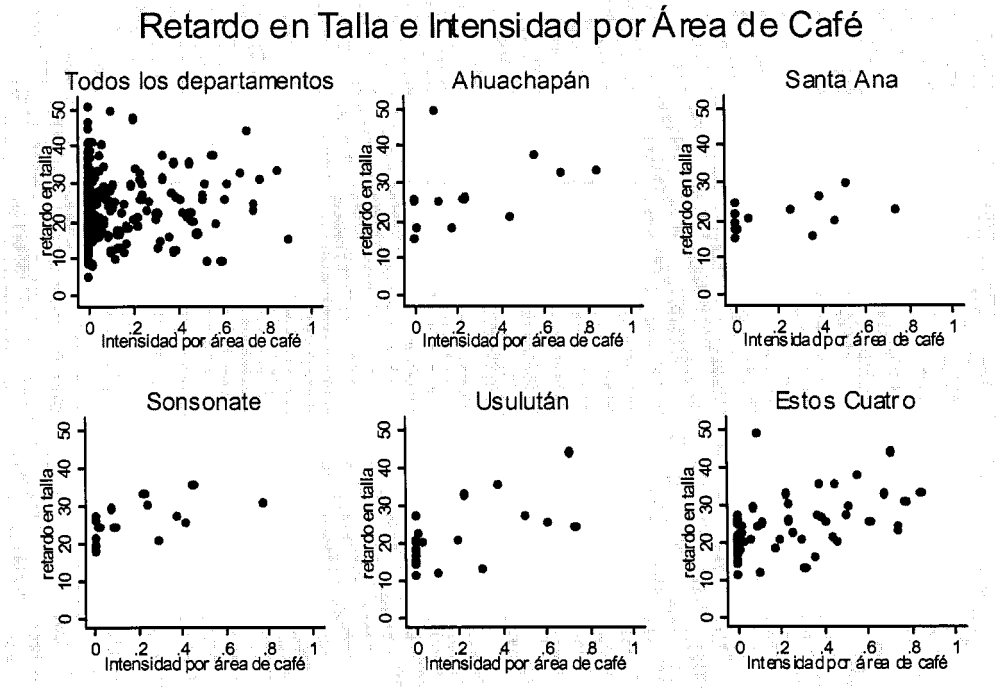
Before we continue with the analysis of the BASIS/FUSADES data set it is worth mentioning two sources of information of social indicators that are available and that might be helpful to assess the effects of the coffee crisis in El Salvador. These indicators are malnutrition and the percentage of stunted children. These measures of health and nutrition are widely use in empirical research as outcomes that result from decision of households facing prices and by resources that they hold (see Behrman and Deolalikar 1988).

PERCENTAGE STUNTED VERSUS COFFEE INTENSITY IN MUNICIPALITIES

One source of information about nutritional status is stunting (height to age) of children at the municipal level. The source of this information is the school census of 2000 fielded by the Ministry of Education (MINED). The next graph presents plots of the height-for-age data and coffee area intensity at the municipal level for all the country and for selected *departamentos*. At glance, with the full sample it is impossible to claim that there is any correlation between stunting and coffee areas, suggesting that the spread of nutritional deficiencies in the school population is explained by other factors. The simple correlation between stunting and coffee intensity is equal to 0.1340. One problem with the data, is that it does not differentiate between urban and rural areas. To dig a little bit more into the data, similar plots are presented for those departments where coffee area intensity is higher, Ahuchapán, Santa Ana, Sonsonate, and Usulután. In this cases there is a positive correlation between coffee are intensity and the percentage of children suffering from malnutrition, meaning that high intensity coffee areas suffer from high poverty rates.

However, this outcome does not imply that the coffee crisis is having an impact on the nutritional status of children, because it is looking only at a cross section of municipalities. We are interested in the changes in nutritional status from one year to another, with the hypothesis that those households living in areas where coffee activities are predominant might suffer more the effects or face more difficulties to satisfy their basic needs. Also, these thoughts send a signal of warning to those that think that aid should go directly to areas where coffee is grown more intensively. We need to look for other factors that are also important in determining which kinds of households would benefit the most with aid programs.

Figure 5: Height-for-Age Ratios and Coffee Area Intensity by Municipalities.

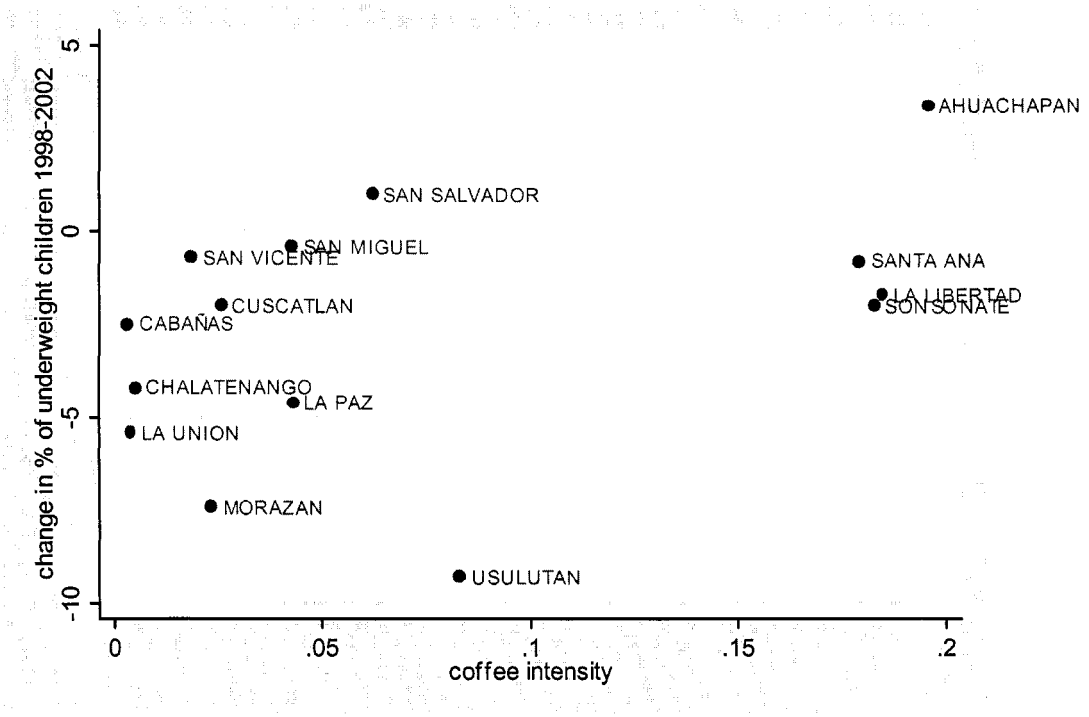


Source: MINED and PROCAFE.

CHANGE IN MALNUTRITION BETWEEN 1998 AND 2001

Using figures published by FESAL (Encuesta Nacional de Nutrición Familiar) for the country as a whole the percentage of underweight children fell from 11.8% in 1998 to 10.3% in 2002/2003. However, **looking at the departmental level and crossing the information with the intensity of coffee areas by departments, those departments with higher coffee intensity have a trend to show a smaller reduction, or even an increase in the percentage of underweight children.** In Figure 6, the horizontal axis is the coffee area intensity index, and the vertical axis represents the change in the percentage of underweight children under 5 years old using data from FESAL 1998 and 2002/2003. Clearly the department with the highest coffee area intensity index, Ahuachapan, has increased the percentage of underweight children. And the other three departments with high coffee area intensity index, Santa Ana, La Libertad and Sonsonate, have decreased the percentage of underweight children, but by a smaller amounts that departments with low coffee area intensity index, such as Usulutan, Morazan, La Paz and La Union.

Figure 6: Change in the percentage of underweight children between 1998 and 2002 by departments and coffee area intensity.



Sources: FESAL and PROCAFE.

Although the graph suggests that there is a positive correlation between malnutrition and coffee area intensity, it is necessary to control for different factors to be able to establish if the coffee crisis is related to this underperformance of coffee intensive departments.[73] Given the small sample size--14 departamentos-- the degrees of freedom for regression analysis is too small and in several specifications none of the coefficients are significant.[74] **Table 8** presents simple correlation coefficients for nutritional change, coffee intensity, rural female literacy rates and the change in real per capita household income between 1998 and 2002. The strongest correlation is between nutritional change and coffee intensity (0.42). The correlation between female literacy rates and the change in nutritional status is positive but smaller (0.17), with an unexpected sign, since higher literacy rates are positively correlated with an increase in the percentage of underweight children. The change in real per capita household income and the change in percentage of underweight children are negatively correlated (-0.13); thus, increases in real per capita income are associated with improvements in nutrition of children. Overall the strongest association is between nutritional change and coffee intensity.

[73] At the end of the statistical annex we present a graph associating the change in malnutrition with the percentage of coffee-worker households in the BASIS 1997 data set, and the conclusion are similar.

[74] Simple and multiple regressions were performed for the change in the percentage of underweight children against coffee intensity, rural female literacy rates in 1998, and change in real per capita household income at the departamental level.

Table 8: Simple correlation matrix of change in percentage of underweight children and potencial correlates.

	Change in % of underweight children 1998-2002	Coffee intensity	Female literacy rates in rural areas in 1998	Percentage change in real percapita household income, 1998-2002
Change in % of underweight children 1998-2002	1			
Coffee intensity	0.4212	1		
Female literacy rates in rural areas in 1998	0.1725	-0.0582	1	
Percentage change in real percapita household income, 1998-2002	-0.1286	-0.1883	-0.0052	1

Sources: FESAL (Change in % of underweight children 1998-2002), PROCAFE (Coffee intensity), and EHPM 1998 and 2002 (Female literacy rates in rural areas in 1998 and percentage change in real per capita household income, 1998-2002).

Comparative analysis of socio-economic characteristics between coffee and non-coffee households.

The classification of households as non-coffee, coffee workers and coffee growers is helpful to identify some socio-economic differences, and this distinction is critical to the story that unfolds below. As many of the statistics show, forming a group of coffee-related households may be misleading, as growers and workers are very different group.

DEMOGRAPHIC DIFFERENCES

In demographics, non-coffee households have approximately 6 members per family, while coffee workers have more than that and coffee growers have fewer.[75] The difference in household size is statistically significant between coffee workers and coffee growers. The average age of the head of the household is similar between non-coffee households and coffee workers (the difference is not statistically different from zero). But it is clear that for coffee growers the head of the household is more than 10 years older than the other type of households which might explain why they have fewer children, and hence, fewer members (the difference is statistically significant at 1% significance level). As expected, the average age of the head of the household also increases over time for all type of households, showing that the panel data captures the life cycle of these households as they get older. The percentage of households where the head is female has increased for non-coffee households from 7 percent in 1997 to 18 percent in 2001, it remained around 10 percent for coffee workers, and it increased from 8 to 19 percent for coffee growers. Therefore among coffee workers there is a predominance of males as head of households, while in the other two groups, women's participation as head of the family has increased over time. This difference is statistically significant between coffee workers and non-coffee households only in 2001, due the increase in women's participation as head of household over the period for non-coffee workers.

DIFFERENCES IN EDUCATION

The average of years of schooling of the head of household is smaller for coffee workers; around 2.5 years of studies for coffee workers and 3 for non-coffee households (the difference is statistically significant only in 2001). Between coffee growers and non-coffee households the difference in years of schooling of the head of households is not statistically different from zero; but between coffee growers and coffee workers it is statistically different from zero (in 1995 and 2001) in favor of coffee growers.

In terms of stocks and flows of human capital accumulation in education coffee growers outperform non-coffee households, and non-coffee households outperform coffee growers. The average years of schooling for adults are higher for coffee growers than for non-coffee households and coffee workers (the differences are statistically different from zero in 2001). In terms of investment in education, the differences between non-coffee and coffee workers are not statistically different from zero (the percentage of children ages 6-12 enrolled in school); but coffee growers have significantly a higher percentage of enrolled children between ages 6 and 12, than the other two types of households. However, for the percentage of children between 13 and 18 years of age enrolled in schools, there are no differences (statistically) among all types of households, suggesting that opportunities or access to education is more difficult at the secondary level for all types of household. Also, investment in education improves over time, with increasing attendance ratios for all types of households.

[75] This section is based on Tables 8.1-8.2 and Tables 9.1-9.3 in the statistical annex.

DIFFERENCES IN LABOR PORTFOLIOS

As a first approximation, labor time has been divided into two categories, wage labor, and self-employed labor, referring to income generating activities. Households with coffee workers participate more as wage laborers than non-coffee households and coffee growers, both in absolute and in relative terms, and their portfolio of time allocation is less diversified. **Table 9** shows that households with coffee workers have a larger share of their time devoted to wage labor, around seventy percent, and that the average of this share is statistically different between coffee workers and the other two types of households. These suggests that both, coffee growers and non-coffee growers may find other income generating activities as self employed, while for coffee growers it is more difficult. In addition, the share of time devoted to wage labor has increased for coffee growers, but has decreased for non-coffee households between 1995 and 1997, and then remained at around forty percent. For households with coffee workers the share of time devoted to wage labor has also decreased over time, but still remaing higher that the other to types of households.

Table 9: Average of share of working time devoted to wage labor at household level.

Average share of hours allocated to wage labor				
Household type	1995	1997	1999	2001
Coffee growers	33.8	33.6	37.9	41.0
Coffee workers	76.0	71.0	67.7	68.2
Non-Coffee	57.9	39.7	38.8	40.9
Total	60.5	46.3	45.2	46.9
t-test of equality of average shares between groups				
Between				
Coffee workers and non-coffee households	4.6*	8.4*	7.6*	7.4*
Coffee growers and non-coffee households	3.0*	0.8	0.1	0.0
Coffee workers and coffee growers	5.1*	4.5*	4.2*	3.3*

* Significant at 1% level.

A second approximation is to divide productive time between agricultural and non agircultural activities. **Table 10** shows that in 1995 and 1997 households with coffee workers spent less time in non-agricultural activities than non-coffee households, but beginning in 1999 these differences are no longer statistically different. Also, for all types of households there is a tendency to increase the share of time devoted to non-agricultural activities, and coffee households have greater changes. This coincides with aggregate data that shows the declining importance of agriculture in GDP.

Table 10: Average of share of working time devoted to no agricultural activities at household level.

Average share of hours allocated to wage labor				
Household type	1995	1997	1999	2001
Coffee growers	27.6	30.3	42.3	48.8
Coffee workers	27.0	22.1	35.7	46.4
Non-Coffee	36.9	38.9	42.4	45.3
Total	34.2	34.7	40.9	45.8
t-test of equality of average shares between groups				
Between				
Coffee workers and non-coffee households	2.4*	4.5*	1.5	-0.2
Coffee growers and non-coffee households	1.2	1.2	0.0	-0.5
Coffee workers and coffee growers	0.1	1.1	0.8	0.3

* Significant at 1% level.

Wage labor between 1995 and 2001.

The evolution of wage labor over time shows that an important structural change is undergoing in rural El Salvador. The number of households with at least one member engaged in wage labor outside the house decreased from 375 to 319 in 1997, and afterwards it increased on every year in the sample, but it is still below the 1995 level. However, this evolution differs by type of household. For instance, for coffee growers the number of households egaged in wage labor increased between 1995 and 2001, for coffe growers it did not changed, while for non coffee households there was a sharp decline in 1997, and an increase in 1999 and 2001, but staying well below the 1995 level (See Table 10 in statistical annex).

By looking at sector-specific changes it is evident that a structural change is under way in the country, the number of households involved with wage labor in the agricultural sector have declined every year; however for coffee households as workers and growers wage labor participation in agriculture increased between 1995 and 1997, but after that year it decreased considerably, while for non-coffee households occurred the opposite, their wage labor participation in agriculture declined in 1997, increased in 1999, and stay at the same 1999-level in 2001. On the other hand, as opposed to wage labor participation in agricultural activities, participation in non agricultural sectors increased for both coffee and non-coffee households, suggesting that **households are moving away from the agricultural sector and increasing their wage labor participation in other sectors**. Coffee households have increased considerable their participation in non-agricultural sector, especially in 1999 and 2001, suggesting that reallocation of time could be an important coping mechanism for these households (see Table 10 in statistical annex).

The average number of hours devoted to wage labor is considerably higher for households with coffee workers only, compared to other types of households (t-test for the equality of average are statistically significant at 1% level; see Table 11 in the statistical annex), suggesting that they are more dependent of wage labor. For households with coffee workers, the average number of hours devoted to wage labor declined in 1997 and gradually recovered to the 1995 level by 2001; mainly as a result of an increase in the average number of hours in the non agricultural sector that offset the decline of the number of hours in agriculture.

Furthermore, in 1995 the average number wage-labor hours spent in agriculture by households with coffee workers was greater than the average number of hours spent in non-agricultural sector, and for coffee growers it was about the same; but by the end of the period for both types of coffee households the average number of hours spent in non-agricultural sector is greater than in the agricultural sector. This shows that households are allocating more time to non-agricultural wage labor and that there are more labor opportunities in this other sectors, as a result of the structural change in the economy.

The total number of hours devoted to wage labor supports a similar idea. In general, total time devoted to wage labor decline in 1997, starts recovering in 1999, and reaches in 2001 a similar level to that of 1995. However, they are decreasing wage-labor time spent in agriculture along the whole period, while for non agricultural sector, there was a decline in 1997, and a rapid recovery in 1999 and 2001, reaching much higher levels. Coffee households devoted in 2001 63.9% more hours to wage labor in the non-agricultural sector than in 1995, while for non-coffee households there was a 14.75% increase between these two years, showing that the change has been bigger for coffee households.

Self-employed labor between 1995 and 2001.

The number of households participating in income-generating activities as self employed, such as microenterprises increased steadily over time; both in agriculture and non-agricultural activities, suggesting that rural households are diversifying their time portfolios. This increase is sharper for households with coffee workers and non-coffee households. The increase in the number of households as self employed between 1995 and 2001 is about 100 additional households; both in agricultural and non agricultural activities (see Table 10 in the statistical annex). It is important to notice that households as coffee growers and non-coffee households participate more than households with coffee workers as selfemployed in non-agricultural activities, meaning that the former are more diversified in their activities.

From the point of view of total number of hours as self employed, overall there is a steady increase from 1995 to 1999, and then it remained stable in 2001. But this trend differs by type of household and activity. For coffee growers there is a decline in the total number of hours devoted to self employment, with a sharp decline in 2001; this decline occurs mainly in the agricultural sector, as expected from the decline in the sector, in part due to the drop in coffee prices. For coffee workers the total number of hours as self employed increased between 1995 and 1999, but it declined in 2001; these movements come from both, agricultural and non-agricultural sectors. For non-coffee households, it increased considerably between 1995 and 1997, and then at slower rates in 1999 and 2001. Between 1995 and 1997 there was an increase in self employment in agriculture for non-coffee households, it remain steady in 1999, but it decrease in 2001; while for non-agricultural activities there was a sharp increase between 1995 and 1997, further increase in 1997 and 1999, and an important increase in 2001 (see Table 10 in the statistical annex).

In a similar trend, the average number of hours devoted to selfemployment increased steadily from 1995 to 1999, and it remain stable in 2001. It is evident that there is a very sharp and steady increase in the average number of hours as selfemployed in non-agricultural activities. On the

other hand, alfthough the average number of hours as self-employed in agricultural activities is higher, there was an increase between 1995 and 1997, remaining at the 1997 level in 1999, and then in decreased in 2001, but it was still higher than in 1995. By type of households, there is a considerable decline in the average number of hours as self-employed in agriculture for coffee growers, while the average hours as self-employed in non-agricultural activities increased in every year of the survey. It is important to notice that the average number of hours as self employed in agriculture was higher and statistically significant for coffee growers, compared to households with coffee workers in 1995 and 1997and to non-coffee households in 1995, but the differences were not statistically signficant afterwards (see Table 12 in the statistical annex). The other important statistically significant difference is that the average number of hours as self-employed is higher for non-coffee households as compared to households with coffee workers in all years.

INCOME DIFFERENCES BETWEEN 1995 AND 2001.

Total per capita income differs among different types of households and in different years. Coffee workers have smaller per capita income (and per capita income net of remittances) than non-coffee households (the difference is significantly different from zero at 1% level of significance) in 1997 and 2001, but not in 1995 and 1999. Coffee growers had significantly higher per capita household income than non-coffee households in 1995 and 1999 only, suggesting that in bad agricultural years their incomes are similar. In all years total per capita income is higher for coffee growers than for coffee workers (the differences are significantly different from zero) suggesting that there is a clear difference is socioeconomic status between these two groups. is much higher for coffee growers than for any other type of household.

The sources of income differ among types of households. First, remittances have a positive trend for all types of ho0useholds. From 1997 onwards non-coffee households receive more remittances than coffee workers (the difference is statistically significant), suggesting that the former group is more likely to be more diversified in their sources of income. Between non-coffee households and coffee growers remittances receipts are not statistically different, nor between coffee workers and coffee growers.

The mean of agricultural income has different trends among the different types of households. For non-coffee households it increases between each year, for coffee workers it increases from 1995 to 1999, but it falls dramatically in 2001, when coffee prices reached the lowest level, and for coffee growers it decreased between each year, with the sharpest decline in percentage terms in 2001. It is remarkable that in 1995 and 1997, both, coffee workers and coffee growers had statistically different (and higher) agricultural income that non-coffee households, but not in 1999 and 2001, reflecting the decline in value added in the coffee sector. Furthermore, for coffee growers, agricultural income is even smaller than for non-coffee households and coffee workers in 2001, reflecting the fact the coffee growers depend more on this crop, and that their decline in agricultural income is therefore higher, due to the drop in coffee prices.

Third, non-agricultural income shows a positive trend in all types of households. While in 1995 and 1997 non-coffee households received higher non-agricultural income than coffee workers (the differences are statistically different from zero), in 1999 and 2001 the differences in non-

agricultural income are not statistically different from zero. This suggests that there is a strong shift to non-agricultural income among coffee workers. Between non-coffee households and coffee growers, and between coffee workers and coffee growers, the differences are not statistically different from zero in any year.

Fourth, there is a clear pattern the source of income generated inside and outside the house differs between non-coffee households and coffee workers in 1997, 1999, and 2001. Clearly, coffee workers depend more on labor income outside the house—wage income—than non-coffee households; income outside the house is higher (differences are statistically different from zero) for the former. On the other hand, income inside the house is higher (differences are statistically different from zero) for non-coffee households than for coffee workers. However, the differences in income inside and outside the house between coffee growers and non-coffee households are not statistically different from zero. Income outside the house is higher for coffee workers than for coffee growers (the difference is statistically different from zero in 1997 and 2001). Finally, income inside the house is greater for coffee growers than for coffee workers (the differences are statistically different from zero in 1995, 1997, and 1999, but not in 2002 suggesting that the drop in coffee prices had a greater effect on coffee growers).

Also, non-coffee households receive about fifty percent of their income from labor outside the house, and fifty percent from labor inside the house—or entrepreneurial activities— while coffee workers rely more on income outside the house—or wage income—on a 80:20 ratio with respect to labor inside the house. Coffee growers have higher income diversification from this point of view, than coffee workers, since they obtained 54 percent of their income outside the house and 46 percent inside the house by 2001. However, in 1995 coffee growers earned 65 percent of their income inside the house and 35 percent outside.

Evolution of income between 1995 and 2001 by type of household.

This section describes the evolution of per capita household income over time, compares it with coffee and non-coffee households, and brakes the latter into coffee growers and non growers, to see if those households involved in coffee sector as laborers only have a different income pattern over time and across households. In this section the classification between coffee and non-coffee households corresponds to 1997 only, that is, we observe the evolution of income for those households that were involved in coffee activities in 1997.

The first observation is that overall the data show a positive trend of average per capita household income, but there are differences by regions and type of households.[76] The second observation is that there are significant income differences among non-coffee households, households involved in coffee production as laborers only and coffee growers. Coffee growers have considerably higher incomes than other type of households in any of the four years, while coffee households as

[76] This trend corresponds to the sample in the panel, and therefore does not correspond to the evolution of average household income at national level. At national level, data from the Multipurpose Household Survey (EHPM) of DIGESTYC, and general macroeconomic indicators show that household income has increased very little over the period. Meanwhile income from this sample has increased. One plausible explanation is that because the BASIS/FUSADES survey keeps track of the evolution of the same households it includes the life cycle movements of income of a typical household, which implies that at certain level of education and experience, income goes up for young households. See Table 8 in statistical annex and the section describing socioeconomic characteristics of the households.

coffee workers only, have considerably lower income than non-coffee households and even lower than coffee growers. Therefore our classification on households based on participation in coffee activities highlight important differences in household incomes (see **Table 11**).

A third observation is that while non-coffee households present a positive trend in per capita income over the entire period, coffee households have more variation in their in per capita income. Coffee households as workers only show a decline in income between 1995 and 1997 of 10.2 percent, and between 1999 and 2001 of 5.3 percent. Similarly, those that were coffee growers in 1997 experience a decline in income in the same periods, but in the 2001 shock the decline is greater suggesting that they have a different pattern in the evolution on income compared to other coffee households. It is not a coincidence that aggregate production data in the coffee sector show a similar trend; the growth rate of GPD in the coffee sector was -5.1 percent b0etween 1995 and 1997, 5.7 percent between 1997 and 1999, and -26.4 percent between 1999 and 2001 (see Table 1 in Annex).

Table 11: Per capita household income by type of household, 1995-2001.

	Per capita Income (1995 colones)				Percentage Change		
Household type	1995	1997	1999	2001	95/97	97/99	99/01
Non-Coffee Households	3280.8	3644.6	5219.2	6307.9	11.1	43.2	20.9
Coffee Households	3488.6	3245.3	5362.7	5095.2	-7.0	65.2	-5.0
As workers only	3020.9	2713.1	4888.5	4628.7	-10.2	80.2	-5.3
As coffee growers	5921.0	5272.0	8943.2	7081.7	-11.0	69.6	-20.8
All Households	3338.4	3533.9	5259.0	5971.8	5.9	48.8	13.6

Source: BASIS surveys, 1995, 1997, 1999, 2001. The sample used is for the 1995/1997/1999/2001 panel.

A fourth observation is that average household per capita income increases over time in all four regions considered in this study. Similarly, if the look at regional patterns by different type of households it is not possible to identify different patterns by regions that could be related to coffee shocks. For instance, for coffee growers income fell in all four regions between 1995 and 1997, and increased in all of them between 1997 and 1999, except in the west region is the most coffee intensive region (see Table 10 in Annex). For coffee households as workers only income fell between 1995 and 1997 in all regions, except the West region which is the most coffee intensive region of the country. In that sense, if we want to identify the effects of the coffee crisis in rural households it would be better to stick to the classification of coffee households based in the 1997 survey.

The data on per capita income provide a first approximation of household's welfare during the period, but it includes information on subsidies and family remittances from relatives leaving abroad. The variable therefore does not reflect household's ability to generate income from productive activities, and is not a good measure to try to capture the effects of the coffee crisis on households in the panel, although it's a better approximation to household's welfare. Alternatively, **Table 12** presents information on per capita net income (subtracting remittances and other subsidies) classifying households by type. In this case, both coffee households and coffee growers present a decrease in income between 1995 and 1997, and between 1999 and 2001; reflecting that 1997 and 2001 were both bad years for coffee production in El Salvador and that it affected negatively on average both types of households. Also the difference between per capita income and net income is particularly large in 2001, suggesting that remittances play an

important role in this year after the shock of earthquakes and the coffee crisis. In fact, for coffee households as workers only the decline of net percapita income was 11.2 percent, but after remittances and other subsidies it was 5.3 percent, meaning that remittances and other type of subsidies ameliorated the negative effects that the coffee crisis and earthquakes might have produced in these households. Similarly, for coffee growers net per capita income declined by 38.2 percent in the same period, but after including remittances and subsidies per capita income decreased by 20.8 percent. In absolute terms the average decline in income was of 3,203 colones, while average remittances were 1894 colones for coffee growers.

Table 12: Per capita household net income by region and type.

	Per capita net income (1995 colones)				Percentage Change		
Household type	1995	1997	1999	2001	95/97	97/99	99/01
Non-Coffee Households	2944.5	3205.0	4190.6	4886.7	8.8	30.8	16.6
Coffee Households	3166.7	3101.6	4885.2	4212.5	-2.1	57.5	-13.8
As workers only	2689.7	2586.4	4387.3	3895.1	-3.8	69.6	-11.2
As coffee growers	5327.1	5063.4	8390.4	5187.4	-4.9	65.7	-38.2
All Households	3006.1	3176.3	4383.1	4699.8	5.7	38.0	7.2

Source: BASIS surveys, 1995, 1997, 1999, 2001. The sample used is for the 1995/1997/1999/2001 panel.

Exploring in more detail the possibility that coffee growers may have different coping mechanisms we can look at differences in changes in per capita income before and after remittances in the two periods where there are negative income shocks. **In the first period, between 1995 and 1997 the negative income shock must have come from a weather related shock since in 1997 the average price for coffee is the highest. In fact there is evidence that in 1997 El Salvador was affected by El Niño, and it has effects on temperatures and rainfall.**[77] The change in per capita net income was negative for both coffee growers and coffee households as workers only, and it was even larger for coffee growers. After including remittances as part of income, the change in income was also negative for both types of households, but the negative change were even higher than net per capita income in both types of households. The reason is that for both types the average of remittances received fell between 1995 and 1997. However, for coffee workers average remittances in 1997 were larger than the negative income shock, 126.7 colones versus 103.2. But, for coffee growers average remittances were smaller than the average net income shock, 206.6 colones versus 263.7, suggesting that remittances, even though increase household's income, were not big enough to offset the negative effect of the weather shock.

On the other hand, between 1999 and 2001 the negative income shock is related to two different types of shocks, the dramatic fall in coffee prices and the two huge earthquakes that hit the country in January and February 2001. In this case, net per capita income fell for both types of coffee households, but it increased for non-coffee households. The difference with the previous shock is that after including remittances the negative change in per capita income for coffee households as workers only decreased from 11.2 to 5.3 percent, implying that remittances were able to offset the negative effects of both shocks in income (remittances increased with respect to 1999). The change in average net income amounted to a decline of 492 colones, while

[77] For instance, Tables 1 and 5 in the statistical annex show that GDP and the volume of volume of production in the coffee in 1997 and 2001 were smaller than in 1995 and 1999. Also, Table 7 in the statistical annex shows that yields per manzana and total production of coffee were smaller in the 97/98 and 01/02 agricultural years. See also Angel (1998).

remittances in 2001 amounted to 733 colones. As was mentioned before, for coffee growers remittances were not able to offset the negative effect on income; the change in average net income amounted to 3,203 colones, and average remittances were 1894.3 colones. Hence, the size of remittances for coffee households is much larger, maybe because coffee growers own land, and therefore, with secure property rights they had the right incentives for reconstruction of their homes and therefore received and important influx of remittances for this purpose. On the other hand, the other type of households is less likely to own land and without adequate property rights they do not receive the necessary aid for home reconstruction. Remittances for coffee growers are almost four times larger than of coffee households as workers only.

INCOME MOBILITY FOR COFFEE AND NON-COFFEE HOUSEHOLDS

The economic position of households may change for a variety of reasons, such as GDP growth, sector specific shocks, weather shocks, or other events. With the panel data set it is possible to study the movement of households through the distribution of per capita income over time, in order to establish how dependent their current position is from a past position, and how this relates to different circumstances, such as their participation in the coffee sector. To achieve this we use a transition probability matrix of income quintiles. Income quintiles give the position of each household in the income ladder in any particular year, so that a specific household might be in a different quintile in every period, or may stay in the same one. The entries in a transition probability matrix indicate what fraction of individuals starting in a particular quintile ends up in another quintile in some other period, hence each row sums to one hundred percent. The percentage probability is calculated based on the information of the position of the household in each of the four years.

The transition probability matrix for all households shows that households in the lower two quintiles are very likely to remain in low income quintiles, and only about 10 percent of these households manage to move to the upper quintile. The same occur for households in the higher quintile, they tend to remain in the highest quintile--about 50 percent of these households--, and less that 10 percent fall to the lowest quintile. This proves that households move up and down in the income distribution over time. Are different types of households more or less mobile? Coffee growers in general appear to have more presence in the upper quintiles of the distribution, which is consistent with the fact that on average they enjoy a higher income. However, regarding mobility they show a pattern of upward and downward movements in the income distribution, except for those at the top quintile which have a 60 percent chance to remain in that quintile. Coffee Households as workers only are concentrated towards the center of the distribution since over time 26.1 percent are in the middle, and less than 20 percent are in each of the lowest and highest quintiles. Income mobility for this type of households is also high. Non-coffee households on the other hand have less participation in the middle quintile and more participation in the lowest and highest quintile, and they also show some mobility, at it is smaller in the two extremes. Therefore, non-coffee households show less mobility than coffee households and they tend stay more time in the richest or lowest quintiles. On the other hand, coffee households show more mobility over time whether they are coffee growers or coffee workers only; but coffee growers are more concentrated in the upper quintiles, while households as coffee workers are concentrated in the middle quintiles.

Table 13: Transitions Probability Matrix of Per Capita Income Quintiles for Different Type of Households.

All Households					
Quintiles	1	2	3	4	5
1	37.6	27.1	14.9	10.5	9.8
2	30.7	26.9	22.4	11.0	9.1
3	18.2	20.6	24.9	24.5	11.9
4	10.7	13.7	21.0	32.1	22.5
5	9.0	5.6	12.3	24.3	48.9
Total	21.5	18.9	19.0	20.3	20.4
Coffee Households					
Quintiles	1	2	3	4	5
1	25.4	34.9	20.6	15.9	3.2
2	28.0	28.0	22.7	14.7	6.7
3	9.3	23.3	33.7	25.6	8.1
4	12.5	12.5	31.8	25.0	18.2
5	8.1	6.5	12.9	27.4	45.2
Total	16.3	20.9	25.4	21.9	15.5
Coffee Households as Workers					
Quintiles	1	2	3	4	5
1	28.3	37.7	20.8	11.3	1.9
2	24.6	29.0	24.6	15.9	5.8
3	8.2	24.7	35.6	23.3	8.2
4	15.7	14.3	27.1	25.7	17.1
5	9.7	12.9	16.1	29.0	32.3
Total	17.6	24.3	26.4	20.6	11.2
Coffee Growers					
Quintiles	1	2	3	4	5
1	10.0	20.0	20.0	40.0	10.0
2	66.7	16.7	0.0	0.0	16.7
3	15.4	15.4	23.1	38.5	7.7
4	0.0	5.6	50.0	22.2	22.2
5	6.5	0.0	9.7	25.8	58.1
Total	11.5	7.7	21.8	26.9	32.1
Non-Coffee Households					
Quintiles	1	2	3	4	5
1	41.0	25.0	13.4	9.1	11.6
2	31.8	26.5	22.2	9.5	10.1
3	22.8	19.2	20.4	24.0	13.8
4	9.8	14.2	15.9	35.5	24.6
5	9.2	5.3	12.1	23.3	50.0
Total	23.5	18.1	16.5	19.7	22.2

Evolution of school attendance

School attendance has increased for households in the sample, especially at preschool and primary education levels, a ten percent point increase at the secondary level, but with a small decline at higher educational levels. There are differences among types of households. With the broader classification of coffee and non-coffee households there are some differences. For instance coffee households have a lower attendance rate at the preschool and higher educational levels, while at primary and secondary education the differences between the two groups as smaller. At primary levels of education, between 7 and 12 years of age, school attendance is very similar to coffee and non-coffee households, with a positive trend over the period. Although coffee households begin with lower attendance ratios that non-coffee households, it seems that the differences tend to narrow over time. A further breakdown of coffee households between coffee grower and households as coffee workers only shows that the differences among groups are wider. For instance, the attendance ratio for households as coffee workers and preschool level was less than have of that of non-coffee households; however over time this gap disappeared. At the higher educational level the gap between households as coffee workers and non-coffee households remain over time. On the other hand, coffee growers have clearly higher attendance ratio than any other group suggesting that they enjoy a higher level of social and economic welfare, which is consistent with their higher incomes (see **Table 14**). The positive trend of school attendance at the lower level of the education system, and the fact that coffee households did not experience a deterioration of school attendance ratio during the coffee and earthquakes shocks could be a result of public policy in El Salvador that has given priority to education expenditure in rural areas over the past decade.

Table 14: School attendance by age group and type of Household

1995					
Age group	noncoffee	coffee	workers	growers	Total
4-6	38.5	23.0	17.0	42.9	34.4
7-12	84.9	73.2	70.7	100.0	81.5
13-15	61.2	64.9	61.5	100.0	62.2
16-18	39.5	45.0	42.0	60.0	41.0
19-25	16.4	13.0	9.5	23.1	15.4
Total	50.6	45.4	44.3	51.5	49.2
1997					
4-6	35.9	33.3	30.5	46.2	35.2
7-12	86.8	88.9	86.9	100.0	87.3
13-15	68.2	64.1	62.5	75.0	67.0
16-18	41.1	32.9	33.3	30.0	38.8
19-25	15.7	11.9	9.3	21.7	14.5
Total	53.4	47.5	46.4	52.8	51.7
1999					
4-6	46.3	31.4	27.9	50.0	42.7
7-12	88.6	86.7	85.7	93.3	88.1
13-15	77.0	72.7	71.7	83.3	75.8
16-18	37.4	49.2	45.5	83.3	41.0
19-25	12.6	9.1	9.1	9.1	11.5
Total	55.1	49.9	49.5	52.6	53.6
2001					
4-6	44.4	51.1	44.7	77.8	46.1
7-12	90.5	91.2	90.6	94.7	90.7
13-15	76.7	71.1	68.3	100.0	75.6
16-18	50.4	50.0	47.5	66.7	50.2
19-25	13.6	9.7	7.9	25.0	12.4
Total	58.7	54.0	51.3	71.7	57.4

Source: BASIS surveys, 1995, 1997, 1999, 2001. The sample used is for the 1995/1997/1999/2001 panel.

A breakdown by regions shows similar conclusions. The West region, the region where coffee plays a greater role compared to other regions, also has a lower proportion of children going to school in 1995, but over time it caught up with other regions (see Table 11 in Annex). Based on this breakdown is not possible to claim that the coffee crisis had a negative impact on school attendance, on the contrary, school attendance has improved in those places where coffee activities predominate. Even though school attendance has improved over time, due to particular educational policies that favored rural areas over the past decade, with these observations alone we cannot claim that the coffee crisis did impair some of the positive effects of educational policy. What these results suggest is that these types of policies are in general positive and can ameliorate or more than offset the negative impact coming from economic shocks.

PROBABILITY OF SCHOOL ATTENDANCE AND COFFEE VARIABLES

The decision to send a child to school depends on the incentives that households face to send their children to school and the opportunity sets that they have. We based this section on a model that states that the decision of sending a child to school is a function of individual characteristics, such as sex and age; and demographic and socioeconomic characteristics of the household, such as the number of siblings of different ages, the number of adults and of elderly, education of the father and the mother, whether the father or the mother are missing, per capita household income net of remittances and of child wages, per capita remittances, land ownership, and distance to school. After controlling for these factors it is possible to examine whether the links to a particular sector have a separate effect on the probability of attending school. The advantage of this approach is that if there are some specific effects of the coffee crisis on the probability of sending children to school, the model will help to identify possible mechanisms through which these effects work.

A random-effects probit model of school attendance for children between 7 and 18 years of age is estimated for all years in the complete panel data set using the framework presented in Trigueros (2002) and we added indicator variables of either the type of household (coffee versus non-coffee households in 1997, the dummy variable COFFEE97) or the intensity of coffee activities in the local community (coffee area intensity). **Table 15** shows explanatory variables to be used in the estimation. The addition of the coffee variables help to assess if controlling for all other factors the linkages to coffee activities have some additional effect on investment in education in a particular year. In order to control for other shocks, dummy variables are included in specific years where a shock could be identify in the neighborhood of a household, such as hurricane Mitch in 1998 and the earthquakes of 2001.

Table 15: Description of explanatory variables for the model of school attendance.

Variables	Description
Individual Variables	
FEMALE	(=1) if person is female.
AGE	Years of age.
AGE2	Years of age squared.
Demographic Variables	
NSIB12	Number of siblings 12 years old or less.
NSIB13_18	Number of siblings between 13 and 18 years old.
NMEN19_59	Number of men between 19 and 59 years old.
NWOMEN19_59	Number of women between 19 and 59 years old.
NMEN_60P	Number of men 60 years and older.
NWOMEN_60P	Number of women 60 years and older.
Variables about education of father and mother and their presence in the family	
PAPAED	Years of schooling of the father.
MAMAED	Years of schooling of the mother.
MISSING_FA	(=1) if father is missing.
MISSING_MO	(=1) if mother is missing.
COFFEE HOUSEHOLDS **Non-coffee households** **Coffee growers** **Coffee workers**	 **(=1) control** **(=1) if the household grows coffee in 1997** **(=1) if household's members worked in the coffee sector in 1997 but did not grow coffee.**
Household's Income and Asset Variables	
PCNINCOME	Per capita income net of remittances and child wages in thousands of colones (US$1=8.75 colones en todos los años).
PCREMITT	Per capita remittances in thousands of colones colones.
OWNLAND	(=1) if the household owns land..
Variables about direct cost of education	
DIST_PRIMARY	Distance to primary school in km. Takes the value of zero for children older than 12 years.
DIST_SECONDARY	Distance to primary school in km. Takes the value of zero for children younger than 13 years.
Other shocks	
Hurricane Mitch (1998)	(=1) if household lives in a region affected by the hurricane.
Earthquakes (2001)	(=1) if household lives in a municipality seriously affected by the earthquakes (more than 25% of homes have some damage)

Table 16: Random Effects of Probit Models for School Attendance.

	1995		1997		1999		2001	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FEMALE	0.219	0.223	0.000	0.021	0.067	0.088	0.251	0.259
	(0.148)	(0.148)	(0.163)	(0.162)	(0.165)	(0.165)	(0.143)	(0.142)
AGE	1.013**	1.016**	0.813**	0.828**	0.870**	0.879**	0.462**	0.470**
	(0.203)	(0.203)	(0.204)	(0.203)	(0.212)	(0.213)	(0.173)	(0.173)
AGE2	-0.048**	-0.048**	-0.043**	-0.043**	-0.043**	-0.043**	-0.025**	-0.026**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.007)	(0.007)
NSIB12	-0.117	-0.119*	-0.161**	-0.165**	-0.104	-0.107	0.059	0.060
	(0.060)	(0.060)	(0.062)	(0.062)	(0.072)	(0.073)	(0.051)	(0.051)
NSIB13_18	-0.106	-0.102	-0.139	-0.140	-0.074	-0.057	-0.111	-0.106
	(0.108)	(0.107)	(0.116)	(0.111)	(0.114)	(0.115)	(0.088)	(0.087)
NMEN19_59	-0.058	-0.037	-0.139	-0.137	-0.008	-0.061	0.164	0.163
	(0.137)	(0.139)	(0.166)	(0.166)	(0.145)	(0.143)	(0.105)	(0.105)
NWOMEN19_59	0.387*	0.368*	0.309	0.328	0.313	0.334*	0.126	0.114
	(0.171)	(0.174)	(0.172)	(0.174)	(0.169)	(0.170)	(0.108)	(0.107)
NMEN_60P	-0.106	-0.022	0.341	0.304	0.002	-0.050	0.183	0.200
	(0.306)	(0.309)	(0.350)	(0.350)	(0.382)	(0.391)	(0.253)	(0.251)
NWOMEN_60P	-0.085	-0.047	0.807	0.880	0.400	0.514	-0.189	-0.187
	(0.462)	(0.467)	(0.593)	(0.605)	(0.609)	(0.614)	(0.447)	(0.439)
PAPAED	0.126**	0.130**	0.072	0.083	0.038	0.043	0.055	0.055
	(0.045)	(0.045)	(0.053)	(0.053)	(0.050)	(0.049)	(0.036)	(0.035)
MAMAED	0.049	0.039	0.114	0.109	0.181**	0.175**	0.162**	0.164**
	(0.051)	(0.051)	(0.059)	(0.061)	(0.057)	(0.056)	(0.040)	(0.040)
MISSING_FA	0.026	0.088	0.478	0.573	-0.047	-0.141	0.307	0.291
	(0.463)	(0.470)	(0.499)	(0.495)	(0.415)	(0.412)	(0.292)	(0.289)
MISSING_MO	0.415	0.457	1.179	1.476	1.034	0.982	1.171*	1.141*
	(0.739)	(0.745)	(1.653)	(1.848)	(0.858)	(0.860)	(0.581)	(0.573)
PCNINCOME1	0.119*	0.132*	0.006	0.009	0.008	0.003	0.003	0.003
	(0.056)	(0.059)	(0.041)	(0.042)	(0.030)	(0.030)	(0.016)	(0.016)
PCREMITT	0.559*	0.583*	0.048	0.038	0.080	0.072	0.099*	0.102*
	(0.230)	(0.230)	(0.099)	(0.099)	(0.071)	(0.072)	(0.046)	(0.046)
OWNLAND	0.445	0.508*	0.549	0.602	0.543*	0.451	0.277	0.281
	(0.231)	(0.237)	(0.472)	(0.467)	(0.269)	(0.268)	(0.180)	(0.185)
DIST_PRIMARY	-0.085	-0.072	-0.066	-0.066	0.094	0.090	0.167	0.161
	(0.094)	(0.094)	(0.099)	(0.099)	(0.167)	(0.167)	(0.138)	(0.137)
DIST_SECONDARY	-0.052*	-0.053*	-0.047	-0.048	-0.083*	-0.089*	-0.014	-0.016
	(0.023)	(0.023)	(0.032)	(0.032)	(0.038)	(0.038)	(0.027)	(0.027)
intensity	-0.811		0.709		1.716*		0.112	
	(0.604)		(0.701)		(0.796)		(0.503)	
coffeeworkers		-0.329		-0.021		-0.028		0.113
		(0.245)		(0.281)		(0.281)		(0.211)
coffeegrower		-1.094		-0.667		1.684		0.698
		(0.761)		(0.752)		(1.059)		(0.676)
mitch					0.330	0.271		
					(0.250)	(0.248)		
terremoto							0.150	0.152
							(0.176)	(0.174)
Constant	-4.480**	-4.556**	-2.518	-2.600*	-3.800**	-3.568**	-1.975	-2.042
	(1.210)	(1.216)	(1.307)	(1.305)	(1.359)	(1.356)	(1.131)	(1.125)
Observations	705	705	722	729	678	683	617	617
Number of hhid	275	275	265	266	255	256	236	236
Rho	0.58	0.58	0.65	0.65	0.61	0.62	0.24	0.23
LR test CHI2	50.87	51.68	74.40	75.86	49.32	50.40	7.03	6.49

Standard errors in parentheses

* significant at 5%; ** significant at 1%

The estimation of the random effects model for the probability of school attendance for rural households in the sample shows mixed results among variables and years. The most consistent result is age, as children grow older the probability of going to school increases, but around age 10 it starts to decrease, reflecting the attendance ratio at the different educational levels. The number of siblings in the household has a negative effect on the probability of school attendance, but only in the earlier years, suggesting that there was a trade off between the quantity and the quality in the number of children, but in 1999 and 2001 the trade off has disappeared. The level of education of the father and/or the mother increases the probability of school attendance in all years except in 1997, suggesting that there might be some intergenerational drag on education for those households with lower education of parents. Per capita net income had a positive effect on the probability of school attendance only in 1997; afterwards the coefficients were not statistically different from zero. Per capita remittances also increases the probability of school attendance but only in 1995 and 2001, and the coefficients differ from those of per capita net income, suggesting that different sources of income have a different effect on the probability of income. In fact, some households receive remittances to support children that were left behind by their parents, and therefore this might be a good reason to expect a positive association between remittances en school attendance. Land ownership had a significant positive effect on school attendance, but only in 1995 and 1999 when agricultural GDP increased as opposed to 1997 and 2001 when it fell. Distance to primary school, reflecting part of the cost to attend school, does not have an impact on school attendance, but distance to secondary school had a negative impact, meaning the living closer to a secondary school increases the probability of school attendance. After controlling for all these factors, the model does not show a statistical difference between non-coffee households and coffee households in the probability of school attendance of children.

However, when looking at the intensity of coffee activities at the local level, the variable for coffee area intensity was statistically different from zero in 1999, when coffee value added increased in the country. This suggests that in normal or bad years those children living in regions with high coffee intensity have the same probability of assisting to school than children in other areas, but in a good year, like in 1999, those children living in areas with high coffee intensity have a higher probability of attending school, even after controlling for all other factors. One possible explanation is that in a good year for coffee production households are better able to support their families without imposing extra work on children, increasing the opportunities to go to school.

Even though we cannot find evidence that the coffee crisis have had some effects on investment on education, if improving the education of children is a concern in rural areas special attention must be paid to landless households that are less likely to receive remittances, have parents with lower levels of education and live farther from secondary schools.

ENROLLMENT RATIOS REGRESSIONS

To take advantage of the panel information we pooled together all years and households following the approach in Conning, Olinto and Trigueros (2000), defining attendance ratio of enrolled children to the total number of children in the respective school age category, S_{it} , where the age categories correspond to primary (ages 6-12) and secondary (13-18) education. We assume that for each school category there is a linear relationship between attendance ratio and households characteristics, X_{it}, shock variables and dummy variables for years, Z_i, a household specific random error to capture unobserved characteristicas, v_i, and a general random error, u_{it}.

$$S_{it} = \beta' X_{it} + \gamma' Z_i + v_i + u_{it}.$$

Household characteristics included in the model are household size, whether head of household is female, education of the head of household, per capita income net of remittances, per capita remittances, size of land owned. Shock variables includes dummy variables for each year, with 1995 as reference year, variables that link households to coffee activities at regional level (intensity of coffee area, and an interaction of coffee intensity with the 2001 dummy) and at household level (dummy variables for type of household, with non-coffee households as reference type, an interaction term for households as coffee growers and coffee workers with the 2001 dummy to capture the coffee–price shock), and a dummy variable for areas affected by the 2001 earthquakes. The equation was estimated using a random-effects tobit model to take advantage of the panel information of the data set.

A household with a male as head of household, with larger size, lower years of schooling for the head of household, less per capita income net of remittances, less remittances, smaller land plots, have a lower chance to send children 6 to 12 years old to school (Table 16). This provides a clear example about the difference between insecurity and vulnerability. Given that in an evironment with perfect markets education is a function of expected future income, when markets are incomplete, investment in education will be a function of present income or availability of assets that may help to cope with an income shock (Jacoby and Skoufias, 1997). In these results, investment in education is a function of current asset position, and in that sense, those households with worse asset position (no land or land of small size) and low income are vulnerable, since they are more likely to keep their children out of school. On the other hand, households in a better position may suffer insecurity, but are less vulnerable. The dummy variables for each year are also significant, showing that after controlling for these factors, there was an improvement in attendance ratios over time, in part explained by government efforts to improve education coverage in rural areas. On the other hand, the dummies that attempt to control for the coffee price shock and for the earthquakes are not significant, even if we do not control for household characteristics. Only for coffee growers the coefficient is positive and significantly different from zero. What this means, is that once we control for household's characteristics the specific indicators for coffee involvement are not useful. Since we know that households with coffee workers have a profile that resembles poor households, we can conjecture that many of these households have been affected by the coffee crisis. But it is more important to identify them according to their asset position and characteristics (education of head of household, family size, land ownership, remittances) rather than to derive conclusions based on their linkage to coffee activities; given the diversity of households involved in one activity.

For enrollment in secondary education at household level, the key variables that increase the chance of sending children to school are years of education of the head of the household, per capita remittances, size of land owned, and distance to the closest secondary school. The conclusion is similar to primary education enrollment ratios, except that the relevant variables are different. In this case, distance to secondary education seems to be a binding constraint to send children to school, which reflects that policy efforts had been oriented mainly to primary education where distance to school was not significant. In this case, households current asset position is also important (years of schooling of head of household and land size), meaning that those households with worse current asset position are more vulnerable and less able to protect their long run investment in education. Yearly dummies are not significant, expect for 2001, wich maybe reflects a new wave of policy efforts to increase attendance at this level. After controling

for household charcteristics external shocks dummies are not significant. If we do not control for household characteristics, the dummy for coffee workers has a significant negative coefficient, but not the interaction term with year 2001, suggesting that lower attendance ratio at secondary level for households with coffee workers respond more a structural problem represented by household characteristics.

Table 17: Random effect tobit model for enrollment ratios

	enrollment ratio for 6-12 years old				enrollment ratio for 13-18 years old			
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HHSIZE	-0.061**	-0.064**	-0.061**		-0.022	-0.019	-0.021	
	(0.023)	(0.023)	(0.023)		(0.021)	(0.021)	(0.021)	
FEMALEHEAD	0.379*	0.380*	0.359		0.016	0.011	0.011	
	(0.192)	(0.194)	(0.192)		(0.151)	(0.153)	(0.151)	
HEADSCHOOL	0.098**	0.102**	0.096**		0.137**	0.137**	0.137**	
	(0.021)	(0.022)	(0.021)		(0.019)	(0.020)	(0.019)	
NETPCINCOMEt	0.064**	0.070**	0.063*		0.006	0.006	0.005	
	(0.025)	(0.025)	(0.025)		(0.014)	(0.014)	(0.014)	
PCREMITTt	0.231**	0.227**	0.231**		0.103**	0.098**	0.096**	
	(0.074)	(0.074)	(0.075)		(0.037)	(0.037)	(0.037)	
LANDSIZE	0.045*	0.042*	0.042*		0.033**	0.035**	0.032**	
	(0.019)	(0.018)	(0.018)		(0.010)	(0.011)	(0.010)	
DISTANCE1	-0.064	-0.043	-0.062					
	(0.044)	(0.045)	(0.044)					
DISTANCE2					-0.026*	-0.025*	-0.025*	
					(0.012)	(0.012)	(0.012)	
intensity		-0.497		-0.087		0.141		0.755
		(0.355)		(0.401)		(0.337)		(0.397)
intensity_D2001		0.490		0.171		-0.060		-0.094
		(0.577)		(0.649)		(0.562)		(0.627)
earthquake		0.079	0.079	-0.054		-0.266	-0.271	-0.337
		(0.208)	(0.209)	(0.204)		(0.192)	(0.191)	(0.189)
D_coffee_growers			0.868	1.114*			-0.019	0.002
			(0.512)	(0.546)			(0.381)	(0.427)
D_coffee_workers			-0.174	-0.303			-0.234	-0.474**
			(0.158)	(0.185)			(0.149)	(0.178)
Dgrowers_D2001			0.150	0.085			-0.252	0.151
			(0.942)	(0.896)			(0.697)	(0.690)
Dworkers_D2001			0.116	0.019			0.162	0.082
			(0.259)	(0.286)			(0.236)	(0.264)
Constant	1.680**	1.708**	1.702**	1.760**	0.377*	0.334	0.410*	0.566**
	(0.221)	(0.224)	(0.222)	(0.122)	(0.191)	(0.195)	(0.193)	(0.100)
D1997	0.354**	0.363**	0.364**	0.367**	0.164	0.199	0.184	0.217
	(0.128)	(0.130)	(0.129)	(0.128)	(0.123)	(0.126)	(0.123)	(0.125)
D1999	0.299*	0.311*	0.308*	0.442**	0.200	0.197	0.218	0.282*
	(0.128)	(0.128)	(0.128)	(0.124)	(0.124)	(0.124)	(0.124)	(0.122)
D2001	0.493**	0.414*	0.440**	0.669**	0.276*	0.385*	0.362*	0.502**
	(0.136)	(0.173)	(0.168)	(0.168)	(0.128)	(0.166)	(0.159)	(0.158)
Observations	1638	1615	1638	1620	1427	1407	1427	1458
Uncensored obs.	243	240	243	242	334	328	334	336
Left-censored obs.	168	166	168	167	458	449	458	471
Right-censored obs.	1227	1209	1227	1211	635	630	635	651
Number of nu	691	682	691	682	647	640	647	650
Rho	0.40	0.42	0.39	0.50	0.31	0.30	0.31	0.40
LR test CHI2	71.98	72.69	75.08	34.92	83.58	82.88	86.84	21.96
Chi 2 for LR test for random effects	72.32	77.03	71.12	118.59	51.48	50.45	51.91	91.28

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Conclusions

When studying the effects of the coffee crisis in rural households in El Salvador it is necessary to recognize that over the past decade the economy has experienced important structural changes, among them, a reduction of the share of agriculture in total GDP and the share of rural population in the country.[78] These effects have been captured by the BASIS/FUSADES panel data set in several ways. Households have increased the total and the average number of hours in non-agricultural activities, while at the same time decreased them in agricultural activities. Given these trends, one has to be careful about attributing all the observed changes in coffee households' labor and income patterns to the most recent changes in international coffee prices, as some of the shifts may be attributable to broader structural changes in the economy.

Nonetheless, the data set show that on average and over time fewer households are involved in the coffee sector. The probability of being a coffee grower is lower for 1997 and 2001 (especially 2001), precisely when the value added in the coffee sector was smaller compared to the earlier two years. This could imply that the impact of the coffee crisis might not be very big in El Salvador, given the persistent trend of movements away from the sector. In other words, given the fact that over the past decade household have been moving away from agricultural activities, including coffee related activities, any negative impact that the most recent coffee crisis might have had is smaller than if those previous changes had not occurred. This does not imply that for those households that have remained in the sector the effects of the crisis may not have been devastating. Therefore, it is important to identify who and where are those households.

Household's socioeconomic characteristics show that those involved in the coffee sector with some members participating as wage laborers in the sector in 1997 have lower income and per income, less remittances, larger-than-average family size, and below average years of education of the head of the household and education of adults in general. In the other extreme, coffee growers have larger than average income and income percapita, larger remittances, higher levels of education of the head of the households and adult members and smaller family size. Non-coffee households are in between. This points to the conclusion that the distinction between coffee-worker-only households and coffee growers is important, with workers living in a more vulnerable situation (with respect to poverty) than growers.

Using alternative data sources it was possible to show a negative association between the intensity in coffee areas and declines in the percentage of underweight children at the departmental level. In general, between 1998 and 2002, the percentage of underweight children decreased more in those departments where the percentage of land devoted to coffee production was smaller. An extreme case is Ahuachapan, the department with the highest coffee intensity, where malnutrition actually increased between 1998 and 2002. Santa Ana is similar in coffee intensity, but showed a small decline in child malnutrition. Putting together the fact that Ahuachapan and Santa Ana are two of the departments with more coffee involvement, that the percentage of coffee-workers households is highest in these two departments, and that these type of households present socioeconomic characteristics that put them at the bottom of the welfare scale in society, we see at least circumstantial evidence that the negative effects of the coffee crisis were greater in these places. La Libertad, Sonsonate, and San Salvador, with high coffee participation and intensity also show poor performance in reduction of malnutrition, but not as

[78] The share of agriculture as a percent of GDP, the share of the population that is rural, and the share of the labor force that works in agriculture have all tended to decline across Central America since 1990. These trends reflect broader structural changes that were occurring in the region's economies. At the same time, cross-country data suggest that such structural changes, particularly in the labor force, may have been occurring relatively rapidly in El Salvador (see World Development Indicators 2005).

bad as Ahuachapan and Santa Ana. As suplementary information, data at municipal level in those departments with high coffee intensity show that there is positive correlation between coffee-area intensity and height–for-age ratios, supporting the idea tha coffee intensive areas present problems of child nutrition, and therefore policy efforts should focused on programs to reinforce child nutrion on those areas, paying additional attention to efforts to focus the aid on those who need it most.

From a dynamic perspective, income of coffee-worker and coffee-grower households changes over time, following the same general pattern as that of aggregate figures in national accounts, although their income is more volatile than non-coffee households. Coffee household's income decreased in 1997 and 2001, and they also show or appear to have more mobility than non-coffee households. However, coffee growers are concentrated in the upper quintiles, while the distribution of coffee workers households is more concentrated in the middle quintiles.

Changes in per capita income and net income for coffee households show that the latter has more variation, and that is explained in part by changes in family remittances, which turn out to be a source of income smoothing related to migration and risk management. The 2001 negative income shock on coffee households was larger than that of 1997, but it is hard to isolate the changes between the shock in coffee prices and the earthquakes. In 2001 remittances were higher for both types of households, i.e., coffee-workers and coffee-growers. But for coffee growers, while in 1997 remittances were not able to offset the negative income shock, in 2001 they were. The difference might be that after the earthquakes, coffee growers, who are land owners, received considerable larger amounts of remittances. One plausible explanation is that by being land owners, they have more secure property rights and, therefore, the incentives for reconstruction are higher.

Regarding investments in education, we were not able to find a direct negative effect of participating in the coffee sector on the probability of sending a child to school. Econometric analysis shows that households without land, with low parents' education, with fewer remittances and that are farther away from school have more difficulties in sending their children to school. Coffee related activities do not seem to have a direct impact on schooling after controlling for other factors. However, given current asset position of households with coffee workers, such as lower years of schooling of parents and smaller or no land, and that such households are poorer and receive fewer remittances, they might face difficulties in sending their children to school. But other types of households also have similar characteristics. Even though the coffee crisis might have had a negative effect through the income effect, its impacts may have been offset by an aggressive public policy campaign to increase school attendance in rural areas through several programs of school constructions, EDUCO, and *Escuela Saludable* (Healthy School) a school program that includes provision of food supplements.

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STATISTICAL ANNEX

Table No. 1
Gross Domestic Product by Branch of Economic Activity
At Constant Prices of 1990
(Millions of Colones)

Branch of Activity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 p/	2002 p/
GDP	37,791.4	40,642.7	43,638.0	46,278.2	49,237.7	50,077.8	52,204.1	54,161.6	56,029.5	57,235.8	58,196.7	59,426.5
1. Agriculture, Hunting, Silviculture and Fishing.	6,222.7	6,722.8	6,549.6	6,394.0	6,683.1	6,767.1	6,791.0	6,743.3	7,260.0	7,032.0	6,846.3	6,862.9
01 Coffee (Café oro)	1,665.6	1,848.3	1,670.1	1,562.8	1,544.4	1,565.3	1,465.9	1,344.0	1,549.3	1,325.2	1,140.1	966.8
02 Cotton	51.2	55.7	49.4	28.0	-	-	-	-	5.4	8.9	3.6	3.8
03 Basic Grains	1,172.4	1,496.6	1,504.4	1,206.3	1,374.1	1,356.8	1,297.0	1,193.6	1,416.6	1,301.9	1,295.3	1,388.6
04 Sugar Cane	276.3	297.9	304.7	288.5	287.2	307.5	381.0	437.7	424.2	418.5	408.2	404.4
05 Other agricultural products	924.2	867.4	939.0	1,039.4	1,097.1	1,148.3	1,177.2	1,195.1	1,230.1	1,254.8	1,279.9	1,311.9
06 Cattle farm	1,000.8	970.4	894.8	1,025.1	1,076.4	1,082.3	1,169.5	1,192.3	1,219.5	1,249.0	1,250.5	1,269.3
07 Aviculture	588.7	639.7	609.0	652.7	700.5	686.8	728.1	782.9	846.9	909.8	895.0	953.2
08 Silviculture	374.9	372.2	385.1	365.9	374.1	381.6	386.1	386.2	393.9	397.8	399.8	399.8
09 Products from hunting and fishing	168.6	174.5	193.0	225.3	229.3	238.5	186.3	211.1	174.1	166.1	173.9	165.2

SOURCE: Banco Central de Reserva

Table No. 2
Gross Domestic Product by Branch of Economic Activity
At Constant Prices of 1990
(Percentage Share of the sector relative to GDP)

Branch of Activity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000 p/	2001 p/	2002 p/
1. Agriculture, Hunting, Silviculture and Fishing.	16.5%	16.5%	15.0%	13.8%	13.6%	13.5%	13.0%	12.5%	13.0%	12.3%	11.8%	11.5%
01 Coffee (Café oro)	4.4%	4.5%	3.8%	3.4%	3.1%	3.1%	2.8%	2.5%	2.8%	2.3%	2.0%	1.6%
02 Cotton	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
03 Basic Grains	3.1%	3.7%	3.4%	2.6%	2.8%	2.7%	2.5%	2.2%	2.5%	2.3%	2.2%	2.3%
04 Sugar Cane	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.7%	0.8%	0.8%	0.7%	0.7%	0.7%
05 Other agricultural products	2.4%	2.1%	2.2%	2.2%	2.2%	2.3%	2.3%	2.2%	2.2%	2.2%	2.2%	2.2%
06 Cattle farm	2.6%	2.4%	2.1%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.1%	2.1%
07 Aviculture	1.6%	1.6%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.5%	1.6%	1.5%	1.6%
08 Silviculture	1.0%	0.9%	0.9%	0.8%	0.8%	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
09 Products from hunting and fishing	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.4%	0.4%	0.3%	0.3%	0.3%	0.3%

SOURCE: Banco Central de Reserva

Table No. 3
Gross Domestic Product by Branch of Economic Activity
At Constant Prices of 1990
(Percentage Structure of the Agricultural Sector)

Branch of Activity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 p/	2002 p/
1. Agriculture, Hunting, Silviculture and Fishing.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
01 Coffee (Café oro)	26.8%	27.5%	25.5%	24.4%	23.1%	23.1%	21.6%	19.9%	21.3%	18.8%	16.7%	14.1%
02 Cotton	0.8%	0.8%	0.8%	0.4%	-	-	-	-	0.1%	0.1%	0.1%	0.1%
03 Basic Grains	18.8%	22.3%	23.0%	18.9%	20.6%	20.0%	19.1%	17.7%	19.5%	18.5%	18.9%	20.2%
04 Sugar Cane	4.4%	4.4%	4.7%	4.5%	4.3%	4.5%	5.6%	6.5%	5.8%	6.0%	6.0%	5.9%
05 Other agricultural products	14.9%	12.9%	14.3%	16.3%	16.4%	17.0%	17.3%	17.7%	16.9%	17.8%	18.7%	19.1%
06 Cattle farm	16.1%	14.4%	13.7%	16.0%	16.1%	16.0%	17.2%	17.7%	16.8%	17.8%	18.3%	18.5%
07 Aviculture	9.5%	9.5%	9.3%	10.2%	10.5%	10.1%	10.7%	11.6%	11.7%	12.9%	13.1%	13.9%
08 Silviculture	6.0%	5.5%	5.9%	5.7%	5.6%	5.6%	5.7%	5.7%	5.4%	5.7%	5.8%	5.8%
09 Products from hunting and fishing	2.7%	2.6%	2.9%	3.5%	3.4%	3.5%	2.7%	3.1%	2.4%	2.4%	2.5%	2.4%

SOURCE: Banco Central de Reserva

Table No. 4
Gross Domestic Product by Branch of Economic Activity
At Constant Prices of 1990
(Yearly Growth Rates)

Branch of Activity	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 p/	2002 p/	92-95
GDP	7.5%	7.4%	6.1%	6.4%	1.7%	4.2%	3.7%	3.4%	2.2%	1.7%	2.1%	6.8%
1. Agriculture, Hunting, Silviculture and Fishing.	8.0%	-2.6%	-2.4%	4.5%	1.3%	0.4%	-0.7%	7.7%	-3.1%	-2.6%	0.2%	1.9%
01 Coffee (Café oro)	11.0%	-9.6%	-6.4%	-1.2%	1.4%	-6.4%	-8.3%	15.3%	-14.5%	-14.0%	-15.2%	-1.6%
02 Cotton	8.8%	-11.3%	-43.3%	-100.0%	-	-	-	-	64.8%	-59.6%	5.6%	-36.5%
03 Basic Grains	27.7%	0.5%	-19.8%	13.9%	-1.3%	-4.4%	-8.0%	18.7%	-8.1%	-0.5%	7.2%	5.6%
04 Sugar Cane	7.8%	2.3%	-5.3%	-0.5%	7.1%	23.9%	14.9%	-3.1%	-1.3%	-2.5%	-0.9%	1.1%
05 Other agricultural products	-6.1%	8.3%	10.7%	5.6%	4.7%	2.5%	1.5%	2.9%	2.0%	2.0%	2.5%	4.6%
06 Cattle farm	-3.0%	-7.8%	14.6%	5.0%	0.5%	8.1%	1.9%	2.3%	2.4%	0.1%	1.5%	2.2%
07 Aviculture	8.7%	-4.8%	7.2%	7.3%	-2.0%	6.0%	7.5%	8.2%	7.4%	-1.6%	6.5%	4.6%
08 Silviculture	-0.7%	3.5%	-5.0%	2.2%	2.0%	1.2%	0.0%	2.0%	1.0%	0.5%	0.0%	0.0%
09 Products from hunting and fishing	3.5%	10.6%	16.7%	1.8%	4.0%	-21.9%	13.3%	-17.5%	-4.6%	4.7%	-5.0%	8.2%

SOURCE: Banco Central de Reserva

Table No. 5
Volume of Agricultural Production
Calendar Year

Year	Coffe	Cotton	Maize	Beans	Rice Seed	Sorgum	Sugar Cane	Bovine Cattle	Pigs	Milk	Aviculture Meat	Aviculture Eggs
	(1000s of quintales, 1 quintal = 100 pounds)						(1000s of T.C.)	(1000s of heads)		(1000s of litters)	(1000s of pounds)	(x 1000)
1994	3,075.5	41.4	10,405.0	1,344.0	913.0	3,957.0	3,929.3	162.0	134.0	319,200.0	108,375.0	980,000.0
1995	3,040.0	-	14,148.0	1,121.0	722.2	4,369.4	3,875.0	175.0	138.0	282,000.0	119,500.0	992,000.0
1996	3,056.0	-	13,467.9	1,287.1	781.3	3,957.3	4,132.9	162.0	129.0	317,451.0	116,500.0	976,000.0
1997	2,847.3	-	11,182.0	1,464.6	933.4	4,340.8	5,121.0	209.6	149.3	356,400.0	125,100.0	1,000,600.0
1998	2,646.0	-	12,152.0	990.6	690.2	3,665.5	5,897.0	205.6	154.5	331,470.0	138,300.0	1,016,000.0
1999	3,143.4	20.5	14,492.8	1,468.6	810.6	3,031.6	5,699.9	204.0	156.3	349,390.0	152,800.0	1,047,000.0
2000	2,599.6	31.6	12,673.2	1,506.6	667.4	3,239.5	5,607.3	207.6	160.4	386,760.0	165,574.4	1,103,062.7
2001 p/	2,200.0	11.6	12,429.5	1,629.8	533.3	3,273.9	5,506.7	212.0	163.0	390,000.0	161,114.0	1,103,000.0
2002 p/	1,865.0	12.2	13,951.9	1,787.8	411.4	3,061.6	5,458.6	200.0	166.5	390,000.0	170,822.4	1,187,190.0

SOURCE: Figures were prepared from information provided by Consejo Salvadoreño del Café, Cooperativa Algodonera Salvadoreña, Comisión Salvadoreña para el Desarrollo Azucarero y Ministerio de Agricultura y Ganadería y Asociación de Avicultura de El Salvador.
(p) preliminary figures.
Data was obtained from "Revista Trimestral del Banco Central de Reserva".

Table No. 6
Tasa de Crecimiento del Volumen de la Producción Agropecuaria
Año Calendario

Año	Café	Algodón en oro	Maíz	Frijol	Arroz en oro	Maicillo	Caña de Azúcar	Ganado Vacuno	Ganado Porcino	Leche	Avicultura Carne	Avicultura Huevos
	(Miles de quintales)						(Miles T.C.)	(Miles cabezas)		(Miles litros)	(Miles Libras)	(Miles Unidades)
1995	-1%	-100%	36%	-17%	-21%	10%	-1%	8%	3%	-12%	10%	1%
1996	1%	0%	-5%	15%	8%	-9%	7%	-7%	-7%	13%	-3%	-2%
1997	-7%	0%	-17%	14%	19%	10%	24%	29%	16%	12%	7%	3%
1998	-7%	0%	9%	-32%	-26%	-16%	15%	-2%	3%	-7%	11%	2%
1999	19%	0%	19%	48%	17%	-17%	-3%	-1%	1%	5%	10%	3%
2000	-17%	0%	-13%	3%	-18%	7%	-2%	2%	3%	11%	8%	5%
2001 p/	-15%	0%	-2%	8%	-20%	1%	-2%	2%	2%	1%	-3%	0%
2002 p/	-15%	0%	12%	10%	-23%	-6%	-1%	-6%	2%	0%	6%	8%

SOURCE: Figures were prepared from information provided by Consejo Salvadoreño del Café, Cooperativa Algodonera Salvadoreña, Comisión Salvadoreña para el Desarrollo Azucarero y Ministerio de Agricultura y Ganadería y Asociación de Avicultura de El Salvador.
(p) preliminary figures.
Data was obtained from "Revista Trimestral del Banco Central de Reserva".

Table No. 7
El Salvador: Area, Production and Yields of Main Crops

	Area (Thousands of Manzanas, 1 hectare=1.4 manzana)										
	92/93	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**
Coffee	234.2	234.2	234.2	234.2	234.2	234.2	234.2	234.2	231.8	229.9	229.9
Cotton	5.9	6.3	2.5	-	-	-	1.3	3.1	1.4	0.8	1.0
Sugar Cane	74.0	68.2	70.0	70.0	90.0	118.9	109.0	110.0	110.0	110.0	108.0
BASIC GRAINS											
Maize	458.4	440.1	449.3	420.9	398.7	437.4	422.0	376.3	370.4	420.2	353.5
Sorgum	212.7	190.0	173.8	191.8	170.6	177.7	156.2	152.0	134.2	139.2	109.1
Bean	114.1	106.2	107.0	86.6	96.7	118.6	111.5	106.3	112.9	121.7	118.9
Rice	23.6	22.6	21.3	13.7	15.3	21.2	15.0	15.6	11.7	8.9	7.0
TOTAL	1,122.9	1,067.6	1,058.1	1,017.2	1,005.5	1,108.0	1,049.2	997.5	972.4	1,030.7	927.4
	Production (Thousands of Quintales, 1Quintal=46 kilograms)										
	92/93	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**
Coffee	3,820.0	3,117.0	3,055.0	3,032.9	3,066.7	2,739.3	2,600.0	3,411.0	2,200.0	2,200.0	1,700.0
Cotton	87.3	76.6	33.1	-	-	-	14.0	32.6	15.4	8.0	10.0
Sugar Cane*	4,231.9	3,950.7	3,879.4	3,865.9	4,756.0	5,972.5	5,720.8	5,651.3	5,504.7	5,511.5	5,335.3
BASIC GRAINS											
Maize	15,338.8	13,708.5	10,449.0	14,071.3	13,694.8	11,035.9	12,241.2	14,342.6	12,673.2	12,429.5	14,014.9
Sorgum	4,655.5	4,409.9	3,956.9	4,369.4	3,957.3	4,340.8	3,665.5	3,031.6	3,239.5	3,273.9	3,061.6
Bean	1,354.1	1,350.9	1,343.4	1,111.7	1,291.2	1,467.6	1,013.1	1,445.3	1,506.6	1,629.8	1,797.6
Rice	1,564.4	1,619.0	1,405.2	1,111.0	1,202.0	1,436.0	1,061.9	1,247.0	1,026.7	820.4	632.9
	Yields (Quintales per manzana)										
	92/93	**93/94**	**94/95**	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**
Coffee	16.3	13.3	13.0	13.0	13.1	11.7	11.1	14.6	9.5	9.6	7.4
Cotton	14.8	12.2	13.2	n.a.	n.a.	n.a.	10.8	10.5	11.0	10.0	10.0
Sugar Cane*	57.2	57.9	55.4	55.2	52.8	50.2	52.5	51.4	50.0	50.1	49.4
BASIC GRAINS											
Maize	33.5	31.1	23.3	33.4	34.3	25.2	29.0	38.1	34.2	29.6	39.6
Sorgum	21.9	23.2	22.8	22.8	23.2	24.4	23.5	20.0	24.1	23.5	28.1
Bean	11.9	12.7	12.6	12.8	13.4	12.4	9.1	13.6	13.3	13.4	15.1
Rice	66.3	71.6	66.0	81.1	78.6	67.7	70.8	79.9	87.8	92.2	90.4

SOURCE: Consejo Salvadoreño del Café, Cooperativa Algodonera Salvadoreña,

Comisión Salvadoreña para el Desarrollo Azucarero y Ministerio de Agricultura y Ganadería.

Tomado de la Revista del Banco Central de Reserva.

* Sugar Cane is not in Quintales, but in TC.

Table 8.1: Mean and Standard Deviation of Variables Describing Household Characteristics by Type of Household and Years.

VARIABLE	NON-COFFEE HOUSEHOLDS (326 obs.)								COFFEE WORKERS (99 obs.)							
	1995		1997		1999		2001		1995		1997		1999		2001	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Demographics																
Household Size	5.99	2.61	6.06	2.80	5.96	2.63	5.98	2.70	6.34	2.73	6.52	2.51	6.69	2.69	6.46	2.90
# of Children 0-5 years old	0.88	1.04	0.90	1.16	0.75	0.98	0.70	0.97	0.85	1.10	0.86	1.02	0.73	0.96	0.68	0.96
# of Children 6-12 years old	1.17	1.34	1.29	1.30	1.29	1.24	1.25	1.27	1.32	1.31	1.17	1.12	1.25	1.13	1.16	1.22
# of Children 13-18 years old	1.00	1.04	1.00	1.15	0.92	1.11	0.98	1.08	1.03	1.03	1.17	1.18	1.16	1.18	1.01	0.99
# of Adults 19-59 years old	2.56	1.35	2.44	1.25	2.52	1.41	2.49	1.43	2.78	1.70	2.88	1.39	2.98	1.60	2.98	1.54
# of Adults 60 years old or more	0.38	0.73	0.43	0.68	0.47	0.71	0.56	0.76	0.36	0.68	0.41	0.73	0.57	0.78	0.64	0.76
Characteristics of Household Head																
Age of Head of Household	46.58	14.90	49.56	14.04	50.75	14.14	52.92	14.08	45.73	13.37	48.63	14.47	51.48	14.73	53.77	13.75
Dummy variable for Female Head	0.07	0.26	0.11	0.31	0.15	0.36	0.18	0.39	0.10	0.30	0.10	0.30	0.12	0.33	0.11	0.32
Years of Schooling of Head of Household	2.74	3.17	2.54	3.13	2.84	3.22	2.66	3.07	2.70	2.92	2.56	2.92	2.45	2.86	1.92	2.48
Education																
Average Years of Schooling of Adults*	3.40	2.84	3.63	3.04	4.25	3.15	4.15	3.09	3.15	2.52	3.44	2.85	3.64	2.81	3.57	2.73
Number of Children 6-12 years old in school	0.94	1.21	1.07	1.19	1.10	1.15	1.10	1.20	0.89	1.02	0.95	1.00	0.99	1.03	1.02	1.12
Number of Children 13-18 years old in school	0.49	0.78	0.54	0.84	0.54	0.86	0.63	0.88	0.54	0.79	0.56	0.81	0.69	0.95	0.57	0.69
Percentage of Children ages 6-12 enrolled in school*	0.81	0.33	0.83	0.33	0.87	0.29	0.87	0.29	0.74	0.39	0.84	0.33	0.80	0.35	0.89	0.26
Percentage of Children ages 13-18 enrolled in school*	0.50	0.45	0.57	0.45	0.60	0.44	0.66	0.42	0.49	0.45	0.48	0.42	0.58	0.41	0.59	0.42
Distance to closest primary school*	1.11	1.27	0.94	1.16	0.88	1.02	0.79	0.89	1.22	1.03	1.09	1.12	1.06	1.33	0.98	1.00
Distance to closest secondary school*	5.67	5.66	3.51	3.76	3.12	3.42	2.32	3.00	4.29	3.35	4.01	4.09	3.17	2.92	3.05	4.02
Work																
At least one household member works in a farm	0.44	0.50	0.25	0.43	0.33	0.47	0.35	0.48	0.79	0.41	1.00	0.00	0.71	0.46	0.69	0.47
At least one household member works in agriculture	0.48	0.50	0.28	0.45	0.36	0.48	0.37	0.48	0.82	0.39	1.00	0.00	0.72	0.45	0.70	0.46
Income																
Remittances	1,534	6,081	2,059	7,722	4,363	11,360	6,054	12,061	1,116	3,014	437	1,431	2,345	6,446	2,180	5,190
Agricultural Income	6,212	10,525	6,413	16,933	7,347	17,399	7,900	21,383	8,282	6,811	8,585	6,261	9,088	10,446	7,918	10,017
Non Agricultural Income	8,966	13,685	10,582	16,414	16,004	24,807	18,232	28,925	6,447	10,652	7,728	13,770	15,043	23,458	15,413	16,624
Income outside home	11,564	14,952	8,977	13,360	11,162	15,916	12,063	14,702	12,783	10,311	14,268	13,560	18,448	18,241	18,047	15,388
Income inside home	2,572	9,291	7,678	19,778	11,559	23,481	13,244	31,830	1,733	5,741	1,988	4,565	5,247	15,031	4,866	9,663
Total Income	16,877	17,077	19,181	23,842	27,896	30,720	32,865	36,473	16,118	11,698	16,908	14,309	26,315	23,593	26,179	17,278
Total Per Capita Income	3,281	3,774	3,645	5,596	5,219	5,775	6,308	7,024	2,850	2,430	2,713	2,076	4,422	5,443	4,573	3,128
Net Income	15,179	16,444	16,995	22,447	23,131	27,958	26,133	34,967	14,729	11,103	16,313	14,495	23,860	22,913	23,331	17,282
Per Capita Net Income	2,944	3,666	3,205	5,417	4,191	5,048	4,887	6,625	2,599	2,325	2,586	2,099	3,965	5,235	3,956	2,963

Table 8.2: Mean and Standard Deviation of Variables Describing Household Characteristics by Type of Household and Years.

	1997 COFFEE GROWERS (26 obs.)							
	1995		1997		1999		2001	
VARIABLE	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Demographics								
Household Size	5.38	2.38	5.54	2.87	5.00	2.64	5.19	2.84
# of Children 0-5 years old	0.73	0.83	0.73	1.25	0.46	0.86	0.42	0.81
# of Children 6-12 years old	0.54	0.76	0.81	0.90	0.73	0.87	0.88	1.07
# of Children 13-18 years old	0.58	0.95	0.69	1.05	0.46	0.71	0.50	0.71
# of Adults 19-59 years old	2.62	1.33	2.42	1.53	2.19	1.47	2.15	1.54
# of Adults 60 years old or more	0.92	0.84	1.04	0.82	1.15	0.88	1.23	0.86
Characteristics of Household Head								
Age of Head of Household	57.85	16.02	61.65	11.33	64.35	11.09	66.15	10.96
Dummy variable for Female Head	0.08	0.27	0.15	0.37	0.15	0.37	0.19	0.40
Years of Schooling of Head of Household	4.42	3.43	3.31	3.03	3.62	3.35	3.23	3.18
Education								
Average Years of Schooling of Adults*	5.52	3.01	5.56	3.44	6.32	3.60	5.49	3.51
Number of Children 6-12 years old in school	0.50	0.71	0.81	0.90	0.65	0.85	0.85	1.01
Number of Children 13-18 years old in school	0.42	0.81	0.35	0.63	0.38	0.70	0.38	0.70
Percentage of Children ages 6-12 enrolled in school*	0.95	0.16	1.00	0.00	0.88	0.31	0.97	0.09
Percentage of Children ages 13-18 enrolled in school*	0.68	0.47	0.48	0.45	0.78	0.44	0.70	0.48
Distance to closest primary school*	1.36	1.39	1.27	1.29	0.62	0.55	0.85	0.84
Distance to closest secondary school*	4.72	3.57	3.07	2.91	3.08	3.00	2.33	1.99
Work								
At least one household member works in a farm	0.27	0.45	0.42	0.50	0.27	0.45	0.31	0.47
At least one household member works in agriculture	0.27	0.45	0.42	0.50	0.27	0.45	0.31	0.47
Income								
Remittances	2,395	4,709	946	2,753	3,038	6,825	5,853	12,216
Agricultural Income	18,217	32,044	10,516	9,680	9,376	15,389	3,572	4,566
Non Agricultural Income	7,380	11,526	11,083	15,139	23,605	24,702	20,502	18,755
Income outside home	8,475	12,131	7,142	10,577	13,355	16,954	11,650	14,861
Income inside home	15,685	30,209	12,751	15,255	16,702	24,663	9,859	15,882
Total Income	28,269	30,050	22,818	16,396	35,763	27,936	31,098	26,128
Total Per Capita Income	5,921	5,772	5,272	5,053	8,943	8,393	7,082	5,776
Net Income	25,597	31,219	21,599	16,532	32,701	28,443	24,074	19,476
Per Capita Net Income	5,327	6,202	5,063	5,113	8,390	8,693	5,187	4,710

Table 9.1: t-tests on the equality of means between non-coffee households and coffee workers.

	NON-COFFEE HOUSEHOLDS (326 obs) versus COFFEE WORKERS (99 obs)							
	1995		1997		1999		2001	
	t test	p value	t test	p value	t test	p value	t test	p value
Demographics								
Household Size	-1.147	0.253	-1.542	0.125	-2.363	0.019	-1.473	0.143
# of Children 0-5 years old	0.280	0.780	0.358	0.721	0.220	0.826	0.205	0.837
# of Children 6-12 years old	-1.044	0.298	0.851	0.396	0.293	0.770	0.659	0.511
# of Children 13-18 years old	-0.281	0.779	-1.278	0.203	-1.812	0.072	-0.271	0.787
# of Adults 19-59 years old	-1.178	0.241	-2.829	0.005	-2.543	0.012	-2.814	0.006
# of Adults 60 years old or more	0.251	0.802	0.223	0.824	-1.058	0.292	-0.893	0.373
Characteristics of Household Head								
Age of Head of Household	0.539	0.591	0.563	0.574	-0.440	0.661	-0.536	0.593
Dummy variable for Female Head	-0.907	0.366	0.269	0.788	0.756	0.450	1.826	0.069
Years of Schooling of Head of Household	0.124	0.902	-0.055	0.956	1.141	0.256	2.463	0.015
Education								
Average Years of Schooling of Adults*	0.823	0.412	0.571	0.569	1.782	0.076	1.725	0.086
Number of Children 6-12 years old in school	0.431	0.667	0.980	0.329	0.894	0.372	0.598	0.550
Number of Children 13-18 years old in school	-0.461	0.646	-0.200	0.842	-1.372	0.172	0.821	0.413
Percentage of Children ages 6-12 enrolled in school*	1.284	0.202	-0.178	0.859	1.406	0.163	-0.581	0.562
Percentage of Children ages 13-18 enrolled in school*	0.157	0.876	1.273	0.206	0.339	0.736	1.082	0.282
Distance to closest primary school*	-0.877	0.382	-1.149	0.252	-1.225	0.223	-1.700	0.091
Distance to closest secondary school*	2.988	0.003	-1.063	0.290	-0.131	0.896	-1.590	0.115
Work								
At least one household member works in a farm	-7.100	0.000	-31.613	0.000	-7.046	0.000	-6.207	0.000
At least one household member works in agriculture	-7.169	0.000	-28.751	0.000	-6.798	0.000	-6.198	0.000
Income								
Remittances	0.923	0.357	3.594	0.000	2.235	0.026	4.570	0.000
Agricultural Income	-2.302	0.022	-1.923	0.055	-1.222	0.223	-0.012	0.991
Non Agricultural Income	1.921	0.056	1.724	0.086	0.352	0.725	1.218	0.224
Income outside home	-0.919	0.359	-3.412	0.001	-3.581	0.000	-3.424	0.001
Income inside home	1.085	0.279	4.791	0.000	3.167	0.002	4.163	0.000
Total Income	0.504	0.615	1.164	0.245	0.542	0.589	2.510	0.013
Total Per Capita Income	1.341	0.181	2.493	0.013	1.257	0.210	3.468	0.001
Net Income	0.312	0.755	0.356	0.722	-0.263	0.793	1.077	0.282
Per Capita Net Income	1.115	0.266	1.686	0.092	0.379	0.705	1.969	0.050

Note: Assumes different variances.

Table 9.2: t-tests on the equality of means between non-coffee households and coffee growers.

	NON-COFFEE HOUSEHOLDS (326 obs) versus COFFEE GROWERS (26 obs)							
	1995		1997		1999		2001	
	t test	p value	t test	p value	t test	p value	t test	p value
Demographics								
Household Size	1.232	0.227	0.889	0.381	1.786	0.084	1.367	0.182
# of Children 0-5 years old	0.887	0.382	0.675	0.505	1.638	0.112	1.651	0.109
# of Children 6-12 years old	3.765	0.001	2.516	0.017	3.035	0.005	1.671	0.105
# of Children 13-18 years old	2.163	0.039	1.428	0.164	3.027	0.005	3.170	0.003
# of Adults 19-59 years old	-0.211	0.835	0.051	0.960	1.112	0.275	1.078	0.290
# of Adults 60 years old or more	-3.165	0.004	-3.652	0.001	-3.847	0.001	-3.856	0.001
Characteristics of Household Head								
Age of Head of Household	-3.470	0.002	-5.139	0.000	-5.881	0.000	-5.789	0.000
Dummy variable for Female Head	-0.116	0.909	-0.585	0.563	-0.047	0.963	-0.139	0.891
Years of Schooling of Head of Household	-2.421	0.022	-1.245	0.223	-1.139	0.264	-0.879	0.386
Education								
Average Years of Schooling of Adults*	-3.402	0.002	-2.559	0.017	-2.685	0.013	-1.749	0.093
Number of Children 6-12 years old in school	2.867	0.007	1.386	0.175	2.501	0.018	1.209	0.236
Number of Children 13-18 years old in school	0.431	0.670	1.447	0.158	1.072	0.292	1.725	0.094
Percentage of Children ages 6-12 enrolled in school*	-2.562	0.023	-7.372	0.000	-0.063	0.951	-3.223	0.003
Percentage of Children ages 13-18 enrolled in school*	-1.122	0.288	0.577	0.576	-1.185	0.267	-0.265	0.797
Distance to closest primary school*	-0.885	0.384	-1.264	0.216	2.127	0.040	-0.357	0.724
Distance to closest secondary school*	1.233	0.226	0.702	0.488	0.066	0.948	-0.023	0.982
Work								
At least one household member works in a farm	1.791	0.083	-1.748	0.091	0.704	0.487	0.469	0.642
At least one household member works in agriculture	2.219	0.034	-1.382	0.178	0.968	0.341	0.597	0.555
Income								
Remittances	-0.876	0.387	1.615	0.111	0.896	0.376	0.081	0.936
Agricultural Income	-1.902	0.069	-1.938	0.060	-0.640	0.527	2.916	0.004
Non Agricultural Income	0.665	0.511	-0.161	0.873	-1.510	0.142	-0.566	0.575
Income outside home	1.226	0.229	0.834	0.411	-0.637	0.529	0.137	0.892
Income inside home	-2.205	0.037	-1.592	0.121	-1.027	0.313	0.946	0.350
Total Income	-1.909	0.067	-1.046	0.303	-1.371	0.180	0.321	0.750
Total Per Capita Income	-2.294	0.030	-1.567	0.127	-2.221	0.035	-0.646	0.523
Net Income	-1.683	0.104	-1.326	0.194	-1.653	0.109	0.481	0.633
Per Capita Net Income	-1.932	0.064	-1.776	0.086	-2.431	0.022	-0.303	0.764

Note: Assumes different variances.

Table 9.3: t-tests on the equality of means between coffee workers and coffee growers.

	COFFEE WORKERS (99 obs) versus COFFEE GROWERS (26 obs)							
	1995		1997		1999		2001	
	t test	p value	t test	p value	t test	p value	t test	p value
Demographics								
Household Size	1.768	0.084	1.581	0.123	2.889	0.006	2.022	0.050
# of Children 0-5 years old	0.599	0.552	0.481	0.634	1.370	0.178	1.368	0.178
# of Children 6-12 years old	3.947	0.000	1.747	0.087	2.538	0.014	1.140	0.261
# of Children 13-18 years old	2.133	0.039	2.019	0.050	3.846	0.000	2.984	0.004
# of Adults 19-59 years old	0.521	0.605	1.379	0.176	2.384	0.022	2.433	0.020
# of Adults 60 years old or more	-3.123	0.004	-3.520	0.001	-3.098	0.004	-3.200	0.003
Characteristics of Household Head								
Age of Head of Household	-3.547	0.001	-4.906	0.000	-4.888	0.000	-4.847	0.000
Dummy variable for Female Head	0.392	0.697	-0.675	0.504	-0.411	0.683	-0.956	0.346
Years of Schooling of Head of Household	-2.352	0.024	-1.134	0.264	-1.620	0.114	-1.953	0.059
Education								
Average Years of Schooling of Adults*	-3.616	0.001	-2.689	0.012	-3.329	0.002	-2.400	0.023
Number of Children 6-12 years old in school	2.256	0.028	0.700	0.488	1.721	0.092	0.766	0.448
Number of Children 13-18 years old in school	0.634	0.530	1.417	0.163	1.809	0.076	1.182	0.245
Percentage of Children ages 6-12 enrolled in school*	-3.061	0.005	-4.029	0.000	-0.728	0.477	-1.931	0.059
Percentage of Children ages 13-18 enrolled in school*	-1.138	0.278	-0.012	0.990	-1.280	0.229	-0.670	0.516
Distance to closest primary school*	-0.476	0.637	-0.654	0.517	2.546	0.012	0.655	0.516
Distance to closest secondary school*	-0.555	0.582	1.306	0.197	0.131	0.896	1.222	0.225
Work								
At least one household member works in a farm	5.300	0.000	5.839	0.000	4.382	0.000	3.663	0.001
At least one household member works in agriculture	5.666	0.000	5.839	0.000	4.493	0.000	3.768	0.001
Income								
Remittances	-1.316	0.198	-0.911	0.370	-0.466	0.644	-1.498	0.146
Agricultural Income	-1.572	0.128	-0.965	0.342	-0.090	0.929	3.226	0.002
Non Agricultural Income	-0.373	0.711	-1.024	0.312	-1.589	0.120	-1.260	0.216
Income outside home	1.660	0.106	2.871	0.006	1.341	0.187	1.939	0.060
Income inside home	-2.344	0.027	-3.556	0.001	-2.261	0.031	-1.530	0.136
Total Income	-2.022	0.053	-1.678	0.102	-1.583	0.123	-0.909	0.370
Total Per Capita Income	-2.652	0.013	-2.527	0.018	-2.606	0.014	-2.134	0.041
Net Income	-1.746	0.092	-1.487	0.146	-1.465	0.152	-0.177	0.861
Per Capita Net Income	-2.202	0.036	-2.417	0.023	-2.481	0.019	-1.268	0.214

Note: Assumes different variances.

Table 10: Allocation of time amont different types of activities and households.

	Number of Households				Percentage				Total Hours				Average Hours (only positive values)			
Self-employed in agriculture																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	24	24	22	23	92.3	92.3	84.6	88.5	78,680	58,968	58,505	39,950	3,278.3	2,457.0	2,659.3	1,737.0
Coffee workers	44	54	63	70	44.4	54.5	63.6	70.7	97,470	128,080	133,114	117,768	2,215.2	2,371.9	2,112.9	1,682.4
Non-Coffee	194	230	245	263	59.5	70.6	75.4	80.7	499,482	598,414	598,377	553,177	2,574.6	2,601.8	2,442.4	2,103.3
Total	262	308	330	356	58.1	68.3	73.3	78.9	675,632	785,462	789,996	710,896	2,578.7	2,550.2	2,393.9	1,996.9
Self-employed in non-agriculture																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	3	5	9	10	11.5	19.2	34.6	38.5	7,384	12,341	17,290	17,472	2,461.3	2,468.3	1,921.1	1,747.2
Coffee workers	4	14	21	22	4.0	14.1	21.2	22.2	10,192	33,423	69,069	59,243	2,548.0	2,387.4	3,289.0	2,692.9
Non-Coffee	42	68	97	117	12.9	20.9	29.8	35.9	83,230	251,433	297,778	378,974	1,981.7	3,697.5	3,069.9	3,239.1
Total	49	87	127	149	10.9	19.3	28.2	33.0	100,806	297,197	384,137	455,689	2,057.3	3,416.1	3,024.7	3,058.3
Self-employed																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	24	25	23	23	92.3	96.2	88.5	88.5	86,064	71,309	75,795	57,422	3,586.0	2,852.4	3,295.4	2,496.6
Coffee workers	47	63	69	75	47.5	63.6	69.7	75.8	107,662	161,503	202,183	177,011	2,290.7	2,563.5	2,930.2	2,360.2
Non-Coffee	217	258	279	289	66.6	79.1	85.8	88.7	582,712	849,847	896,155	932,151	2,685.3	3,294.0	3,212.0	3,225.4
Total	288	346	371	387	63.9	76.7	82.4	85.8	776,438	1,082,660	1,174,133	1,166,584	2,696.0	3,129.1	3,164.8	3,014.4
Agricultural wage labor																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	6	11	7	8	23.1	42.3	26.9	30.8	21,450	14,629	11,180	8,650	3,575.0	1,329.9	1,597.1	1,081.3
Coffee workers	81	99	71	69	81.8	100.0	71.7	69.7	243,770	233,262	190,076	159,106	3,009.5	2,356.2	2,677.1	2,305.9
Non-Coffee	155	92	119	119	47.5	28.2	36.6	36.5	286,605	146,124	143,943	168,844	1,849.1	1,588.3	1,209.6	1,418.9
Total	242	202	197	196	53.7	44.8	43.8	43.5	551,824	394,016	345,199	336,601	2,280.3	1,950.6	1,752.3	1,717.4
Non-agricultural wage labor																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	9	9	13	14	34.6	34.6	50.0	53.8	23,235	25,233	40,777	41,617	2,581.7	2,803.7	3,136.7	2,972.7
Coffee workers	42	41	48	70	42.4	41.4	48.5	70.7	141,024	113,676	182,103	227,555	3,357.7	2,772.6	3,793.8	3,250.8
Non-Coffee	156	135	150	163	47.9	41.4	46.2	50.0	421,681	344,899	414,740	483,882	2,703.1	2,554.8	2,764.9	2,968.6
Total	207	185	211	247	45.9	41.0	46.9	54.8	585,940	483,808	637,620	753,055	2,830.6	2,615.2	3,021.9	3,048.8
Wage labor																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	14	14	18	17	53.8	53.8	69.2	65.4	44,685	39,862	51,957	50,268	3,191.8	2,847.3	2,886.5	2,956.9
Coffee workers	95	99	94	95	96.0	100.0	94.9	96.0	384,794	346,939	372,179	386,662	4,050.5	3,504.4	3,959.4	4,070.1
Non-Coffee	263	206	224	229	80.7	63.2	68.9	70.2	708,266	491,023	558,683	652,726	2,693.1	2,383.6	2,494.1	2,850.3
Total	372	319	336	341	82.5	70.7	74.7	75.6	1,137,764	877,824	982,819	1,089,655	3,058.5	2,751.8	2,925.1	3,195.5
Agricultural labor																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	25	25	23	25	96.2	96.2	88.5	96.2	100,130	73,597	69,685	48,600	4,005.2	2,943.9	3,029.8	1,944.0
Coffee workers	92	99	88	88	92.9	100.0	88.9	88.9	341,239	361,343	323,190	276,875	3,709.1	3,649.9	3,672.6	3,146.3
Non-Coffee	262	259	260	281	80.4	79.4	80.0	86.2	786,086	744,538	742,319	722,021	3,000.3	2,874.7	2,855.1	2,569.5
Total	379	383	371	394	84.0	84.9	82.4	87.4	1,227,456	1,179,478	1,135,194	1,047,496	3,238.7	3,079.6	3,059.8	2,658.6
Non agricultural labor																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	12	13	17	20	46.2	50.0	65.4	76.9	30,619	37,574	58,067	59,089	2,551.6	2,890.3	3,415.7	2,954.5
Coffee workers	45	47	58	77	45.5	47.5	58.6	77.8	151,216	147,099	251,172	286,798	3,360.4	3,129.8	4,330.6	3,724.7
Non-Coffee	178	173	202	221	54.6	53.1	62.2	67.8	504,911	596,332	712,518	862,856	2,836.6	3,447.0	3,527.3	3,904.3
Total	235	233	277	318	52.1	51.7	61.6	70.5	686,747	781,005	1,021,757	1,208,744	2,922.3	3,352.0	3,688.7	3,801.1
Household chores																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	22	26	26	26	84.6	100.0	100.0	100.0	112,129	136,257	114,101	105,278	5,096.8	5,240.7	4,388.5	4,049.2
Coffee workers	94	99	99	99	94.9	100.0	100.0	100.0	487,812	657,303	567,000	527,935	5,189.5	6,639.4	5,727.3	5,332.7
Non-Coffee	316	322	325	323	96.9	98.8	100.0	99.1	1,559,419	1,895,865	1,788,075	1,598,132	4,934.9	5,887.8	5,501.8	4,947.8
Total	432	447	450	448	95.8	99.1	100.0	99.3	2,159,361	2,689,425	2,469,176	2,231,346	4,998.5	6,016.6	5,487.1	4,980.7
Productive labor (wage and self-employed labor)																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	26	26	25	25	100.0	100.0	96.2	96.2	130,750	111,172	127,752	107,690	5,028.8	4,275.8	5,110.1	4,307.6
Coffee workers	99	99	98	99	100.0	100.0	99.0	100.0	492,455	508,442	574,362	563,673	4,974.3	5,135.8	5,860.8	5,693.7
Non-Coffee	326	320	317	323	100.0	98.2	97.5	99.1	1,290,998	1,340,870	1,454,838	1,584,877	3,960.1	4,190.2	4,589.4	4,906.7
Total	451	445	440	447	100.0	98.7	97.8	99.1	1,914,202	1,960,483	2,156,952	2,256,240	4,244.4	4,405.6	4,902.2	5,047.5
Productive labor + household chores																
Type	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001	1995	1997	1999	2001
Coffee growers	26	26	26	26	100.0	100.0	100.0	100.0	242,879	247,429	241,853	212,968	9,341.5	9,516.5	9,302.0	8,191.1
Coffee workers	99	99	99	99	100.0	100.0	100.0	100.0	980,267	1,165,745	1,141,362	1,091,608	9,901.7	11,775.2	11,528.9	11,026.3
Non-Coffee	326	326	325	326	100.0	100.0	100.0	100.0	2,850,417	3,236,734	3,242,913	3,183,009	8,743.6	9,928.6	9,978.2	9,763.8
Total	451	451	450	451	100.0	100.0	100.0	100.0	4,073,563	4,649,909	4,626,128	4,487,585	9,032.3	10,310.2	10,280.3	9,950.3

Source: FUSADES/BASIS surveys, 1995, 1997, 1999 and 2001. The sample used is for the 1995/1997/1999/2001 balanced panel (n=451)

Table 11: t-tests for the equality of average hours of wage labor among different groups.

	1995		1997		1999		2001	
Between	**t test**	**p value**	**t test**	**p value**	**t test**	**p value**	**t test**	**p value**
coffee workers and non-coffee households								
All sectors	2.531	0.013	7.047	0.000	6.593	0.000	5.982	0.000
agricultural activities	4.030	0.000	9.472	0.000	6.794	0.000	4.714	0.000
non-agricultural activities	0.356	0.723	0.406	0.685	1.898	0.060	3.141	0.002
coffee workers and coffee growers								
All sectors	2.583	0.011	4.153	0.000	3.650	0.001	3.982	0.000
agricultural activities	2.709	0.009	6.971	0.000	5.692	0.000	4.792	0.000
non-agricultural activities	1.115	0.268	0.487	0.629	0.586	0.560	1.562	0.125
coffee growers and non-coffee households								
All sectors	-0.859	0.398	0.065	0.948	0.704	0.487	-0.165	0.870
agricultural activities	-0.114	0.910	0.616	0.542	-0.070	0.944	-1.195	0.241
non-agricultural activities	-1.180	0.247	-0.272	0.788	0.767	0.449	0.291	0.773

Source: FUSADES/BASIS surveys, 1995, 1997, 1999 and 2001. The sample used is for the 1995/1997/1999/2001 balanced panel (n=451).

Table 12: t-tests for the equality of average hours as self-employed and household chores among different groups.

	1995		1997		1999		2001	
Between	**t test**	**p value**	**t test**	**p value**	**t test**	**p value**	**t test**	**p value**
Coffee growers and coffee workers								
All sectors	3.493	0.002	2.036	0.049	1.621	0.110	1.024	0.311
agriculture	3.228	0.003	2.002	0.052	2.170	0.036	1.098	0.278
non-agriculture	0.781	0.441	0.535	0.596	-0.092	0.927	0.235	0.815
Household chores	-0.754	0.455	-1.799	0.078	-1.956	0.057	-2.038	0.047
Coffee workers and non-coffee households								
All sectors	-3.135	0.002	-3.298	0.001	-1.848	0.067	-3.898	0.000
agriculture	-2.519	0.013	-2.137	0.034	-2.195	0.030	-2.731	0.007
non-agriculture	-2.060	0.040	-2.540	0.012	-0.855	0.394	-2.635	0.009
Household chores	0.364	0.716	1.716	0.088	0.471	0.638	1.051	0.295
Coffee growers and non-coffee households								
All sectors	2.454	0.021	0.263	0.794	0.385	0.703	-1.697	0.098
agriculture	2.425	0.022	0.952	0.349	1.073	0.292	-0.540	0.593
non-agriculture	0.124	0.902	-1.177	0.246	-0.856	0.398	-1.676	0.102
Household chores	-0.631	0.533	-0.834	0.411	-1.523	0.134	-1.547	0.131

Source: FUSADES/BASIS surveys, 1995, 1997, 1999 and 2001. The sample used is for the 1995/1997/1999/2001 balanced panel (n=451).

Table 14: Per capita household income by Region and Coffee Engagement.

	Per capita Income (1995 colones)				Percentage Change		
	Non-Coffee Households						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	3867.8	3835.5	4936.0	6885.3	-0.8	28.7	39.5
Central I	3106.6	3669.5	5307.8	6793.4	18.1	44.6	28.0
Central II	3057.4	3648.5	4485.6	6170.2	19.3	22.9	37.6
East	3223.0	3534.3	5565.5	5695.6	9.7	57.5	2.3
Total	3280.8	3644.6	5219.2	6307.9	11.1	43.2	20.9
	Coffee Households						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	3426.4	3796.2	5157.6	5173.5	10.8	35.9	0.3
Central I	3936.9	3326.3	6759.4	5848.3	-15.5	103.2	-13.5
Central II	3186.1	1527.8	3146.3	3815.5	-52.0	105.9	21.3
East	2903.1	2407.0	4061.1	3971.8	-17.1	68.7	-2.2
Total	3488.6	3245.3	5362.7	5095.2	-7.0	65.2	-5.0
	Coffee Households as workers only (not coffee growers)						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	2751.8	2832.6	3790.2	4381.9	2.9	33.8	15.6
Central I	3777.1	3147.7	7451.5	5722.5	-16.7	136.7	-23.2
Central II	3167.9	1624.5	3178.0	3307.2	-48.7	95.6	4.1
East	2143.3	2032.3	3546.3	3684.2	-5.2	74.5	3.9
Total	3020.9	2713.1	4888.5	4628.7	-10.2	80.2	-5.3
	Coffee Growers						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	6479.2	6301.3	9450.9	8479.3	-2.7	50.0	-10.3
Central I	4999.0	4368.3	5151.3	6821.6	-12.6	17.9	32.4
Central II	3331.7	1189.1	2892.7	7881.4	-64.3	143.3	172.5
East	7056.3	4655.0	5489.9	6704.1	-34.0	17.9	22.1
Total	5992.2	5272.0	7059.2	7794.4	-12.0	33.9	10.4
	All Households						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	3656.8	3816.5	5042.9	6067.3	4.4	32.1	20.3
Central I	3351.5	3567.5	5739.1	6514.6	6.4	60.9	13.5
Central II	3078.1	3307.7	4270.3	5784.9	7.5	29.1	35.5
East	3176.0	3371.1	5355.1	5444.2	6.1	58.9	1.7
Total	3338.4	3533.9	5259.0	5971.8	5.9	48.8	13.6

Source: BASIS surveys, 1995, 1997, 1999, 2001. The sample used is for the 1995/1997/1999/2001 panel.

Table 15: Net Per capita Household Income by Region and Coffee Engagement.

	Per capita net income (1995 colones)				Percentage Change		
	Non-Coffee Households						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	3642.8	3270.6	4121.2	5339.8	-10.2	26.0	29.6
Central I	2906.2	3553.0	4784.1	5860.9	22.3	34.7	22.5
Central II	2919.3	3384.8	3788.8	5299.5	15.9	11.9	39.9
East	2647.3	2833.9	3909.3	3738.8	7.0	37.9	-4.4
Total	2944.5	3205.0	4190.6	4886.7	8.8	30.8	16.6
	Coffee Households						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	3072.9	3660.7	4851.2	4402.0	19.1	32.5	-9.3
Central I	3772.2	3169.9	6283.6	4862.9	-16.0	98.2	-22.6
Central II	2813.1	1500.5	2783.6	3078.0	-46.7	85.5	10.6
East	2377.0	2217.0	3057.8	2941.4	-6.7	37.9	-3.8
Total	3166.7	3101.6	4885.2	4212.5	-2.1	57.5	-13.8
	Coffee Households as workers only (not coffee growers)						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	2389.0	2737.6	3575.9	4030.4	14.6	30.6	12.7
Central I	3594.2	2999.9	6895.5	4630.0	-16.5	129.9	-32.9
Central II	2748.3	1596.5	2772.1	2798.6	-41.9	73.6	1.0
East	1639.8	1839.7	2304.1	2650.9	12.2	25.2	15.1
Total	2689.7	2586.4	4387.3	3895.1	-3.8	69.6	-11.2
	Coffee Growers						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	6081.7	6060.7	8880.3	6121.0	-0.3	46.5	-31.1
Central I	4792.8	4161.2	4468.7	6495.0	-13.2	7.4	45.3
Central II	3331.7	1164.6	2875.8	5313.3	-65.0	146.9	84.8
East	6559.4	4480.6	5452.0	5701.2	-31.7	21.7	4.6
Total	5653.0	5063.4	6560.9	6163.2	-10.4	29.6	-6.1
	All Households						
Region	1995	1997	1999	2001	95/97	97/99	99/01
West	3370.5	3458.7	4473.4	4891.6	2.6	29.3	9.3
Central I	3161.6	3439.2	5229.6	5566.5	8.8	52.1	6.4
Central II	2902.2	3082.0	3627.2	4936.0	6.2	17.7	36.1
East	2607.6	2744.6	3790.3	3622.5	5.3	38.1	-4.4
Total	3006.1	3176.3	4383.1	4699.8	5.7	38.0	7.2

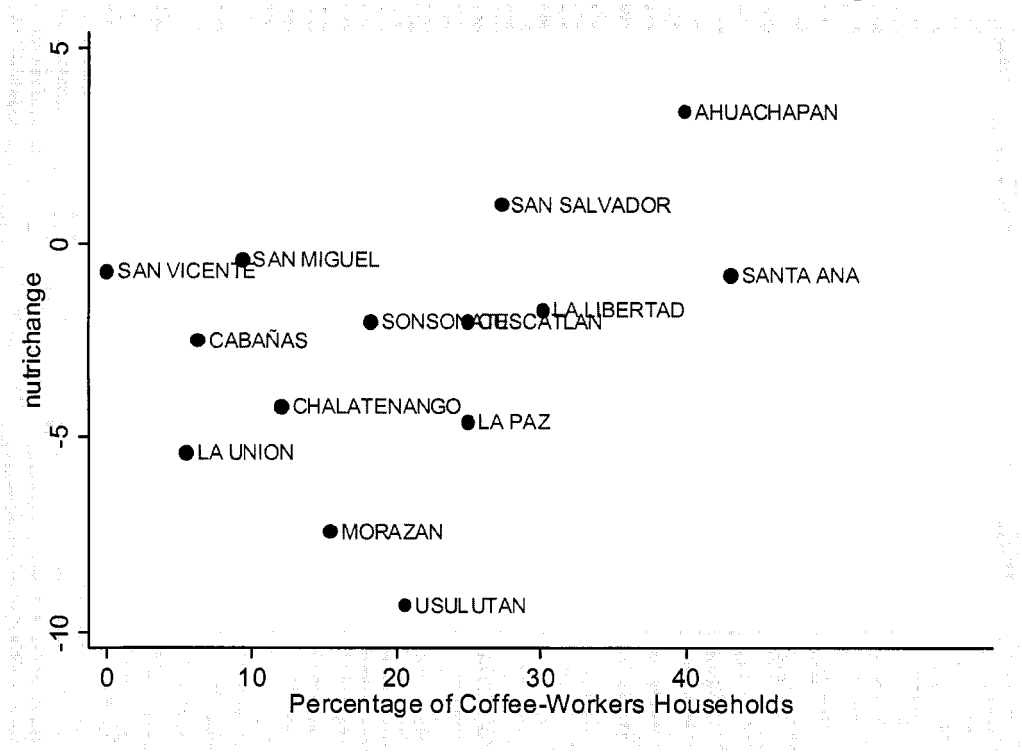
Source: BASIS surveys, 1995, 1997, 1999, 2001. The sample used is for the 1995/1997/1999/2001 panel.

Table 16: School attendance ratios by regions and years.

Age Group	West	Central I	Central II	East	Total
	1995				
4-6	25.4	37.8	34.4	40.4	34.4
7-12	75.8	86.4	86.8	77.5	81.5
13-15	53.5	63.1	72.4	62.5	62.2
16-18	40.8	38.6	42.4	42.5	41.0
19-25	16.9	11.5	15.9	18.2	15.4
Total	43.7	49.8	55.6	49.6	49.2
	1997				
4-6	31.3	37.1	38.5	35.0	35.2
7-12	88.7	90.2	77.5	89.5	87.3
13-15	61.5	70.7	48.7	77.9	67.0
16-18	43.8	29.7	38.2	43.8	38.8
19-25	14.3	10.4	18.0	17.3	14.5
Total	49.9	50.8	49.8	55.0	51.7
	1999				
4-6	25.9	47.9	33.3	54.8	42.7
7-12	88.5	93.1	80.8	86.5	88.1
13-15	63.6	79.7	75.0	82.4	75.8
16-18	31.0	46.4	40.0	43.1	41.0
19-25	7.5	10.7	9.1	16.7	11.5
Total	47.3	56.5	51.4	56.8	53.6
	2001				
4-6	49.0	52.5	34.6	41.8	46.1
7-12	90.3	94.4	87.1	89.1	90.7
13-15	76.1	77.4	69.1	77.5	75.6
16-18	48.1	47.5	53.1	53.0	50.2
19-25	11.2	11.8	12.7	13.6	12.4
Total	57.2	58.7	54.7	57.7	57.4

Source: BASIS surveys, 1995, 1997, 1999, 2001. The sample used is for the 1995/1997/1999/2001 panel.

Figure 7: Change in the percentage of underweight children between 1998 and 2002 by departments and percentage of coffee-workers households in the department.



Coping with the Coffee Crisis in Central America:
The Role of Social Safety Nets in Honduras

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1. Introduction

In spite of some recovery in 1994 and 1998, world coffee prices have declined dramatically since the mid 1980s. Real coffee prices are now at their lowest levels in more than 50 years. Such a substantial decrease in prices has obviously had enormous adverse implications for the incomes of many of the coffee producing countries in Central America and for coffee producers in particular. However, in spite of the widespread perception of rising poverty, little rigorous empirical evidence exists regarding the magnitude and nature of the poverty impact of the crisis. Even less evidence exists with regard to the potential role for social safety net programs both in protecting poor households from such shocks as well as facilitating more efficient responses.[79] This paper contributes to filling some of these knowledge gaps.

Honduras is one of the poorest countries in Latin America with around 70% of its population classified as poor. Unlike other countries in the region, poverty is predominantly a rural phenomenon, with 49% of the total population in 1998 (around 6.5 million) living in rural areas where poverty and, in particular, extreme poverty, are substantially higher (World Bank, 2001; Morris et al, 2002). Also, the extent of poverty in rural areas has increased in recent years and much of this is often attributed to the continued decline in coffee prices over this period.

The analysis in this paper uses household-level survey data collected as part of an evaluation of a recently introduced social protection program in Honduras (called *Programa de Asignacion Familiar*, PRAF). These data provide a very rich source of information for the purpose of addressing the above empirical issues. We use these data to evaluate the impact of the ongoing crisis on some of the poorest rural regions and households in Honduras. In particular, we evaluate the effectiveness of PRAF in enabling poor households to protect their welfare against such shocks. The analysis may also help to improve our understanding of the role of social safety net programs more generally in protecting against economic shocks as well as of the nature of risk coping strategies available to poor households.

In Section 2 we provide a brief overview of coffee in the context of the Honduran economy. In Section 3 we describe the program and survey design. Section 4 provides some descriptive analysis of the data, with special emphasis on the extent of involvement in coffee in the program area as well as differences in socio-economic characteristics across coffee/non-coffee households.

[79] See Morris et al (2002) for a discussion of the impact of Hurricane Mitch in late October 1998 on some of the poorest municipalities in Honduras, in particular the discussion on the extent and distribution of foreign aid. The tropical storm Michelle also affected substantial areas in Honduras in the fall of 2001.

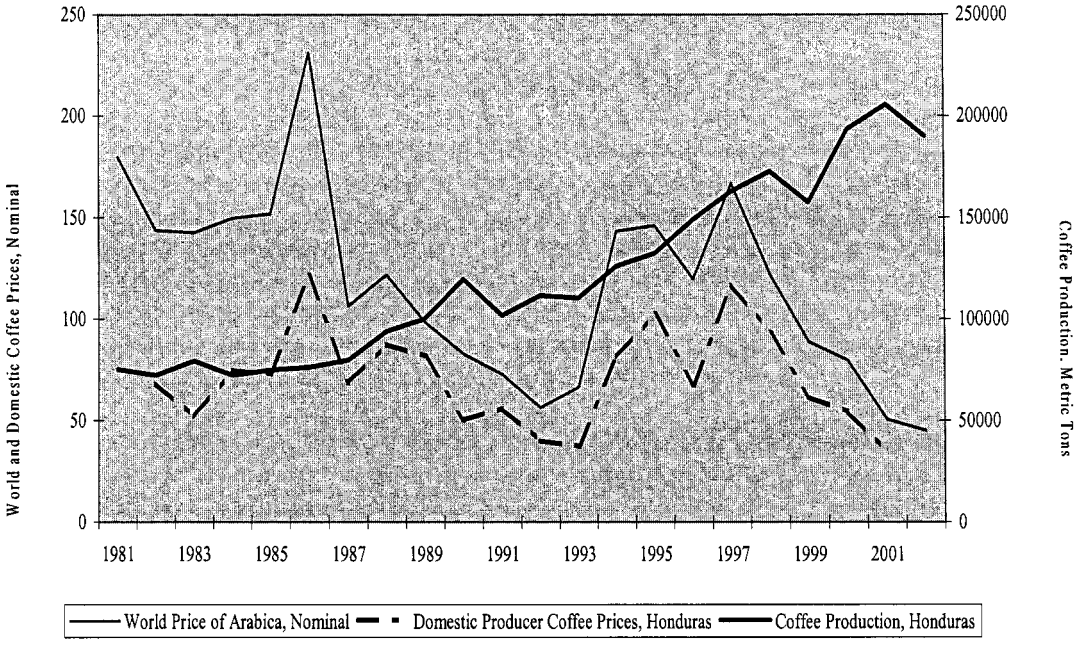
Section 5 evaluates the impact of the program on household consumption and Section 6 examines impacts on labor supply on coffee farms. Section 7 provides some concluding remarks.

2. Coffee in Honduras

Coffee is extremely important to Honduras in terms of output, employment, and export earnings (McCarty and Sun, 2003; Partners, 2002; Varangis, 2003). In terms of output, in 2002/2003 the area under coffee cultivation reached 233,750 hectares, accounting for 65% of total permanent crop area.[80] A large amount of the coffee is also grown on small farms in isolated, high altitude areas; for 92% of growers annual coffee production is less than 100 quintales per farm, most of which is sold to the market through intermediaries. Coffee is also seen as a major source of employment, employing up to one third of the labor force in rural areas (Hearne et al, 2002). Coffee is the second most important export crop in Honduras in value terms and accounts for almost 25% of national GDP. In 2000 the value of coffee exports was $345.2 million, which represents over 26% of total export revenue for that year.

During 2000 and 2001, continued increases in world supply led to some of the lowest real coffee prices over the last few decades. Since mid 2001, both the nominal and real prices of Arabica coffee, both domestically and on international markets (Figure 1), have continued to decline. Yet, in spite of this, coffee production in Honduras (as elsewhere) has been increasing over this period.

Figure 1: World and Honduras Domestic Coffee Prices and Production



Source: International Coffee Organization, FAO (Reproduced from McCarty and Sun, 2002).

[80] The main coffee variety produced in Honduras is the Arabica coffee variety. In recent years there has been concerns about the quality of the coffee being produced and its economic consequences, with Honduran coffee being subject to penalties of between 5-20 cents per pound on world markets over the past few years (Herne et al, 2002). The European Union is the predominant destination for Honduran coffee exports.

3. The Program and Survey Design

In late 1998, the Government of Honduras initiated the PRAF/IDB Phase II Project, which is one of the largest social investments in the history of Honduras. The program covers households in 70 (out of 297) of the most disadvantaged municipalities in 7 departments (Copan, Intibuca, Ocotepeque, F. Morazan, La Paz, Sta. Barbara and Lempira), these all being located in the western part of Honduras and covering many of the major coffee-growing departments. Program transfers are roughly 3% of total household consumption on average, but are substantially higher for the poorest households.

For the purpose of selecting participating households, the government first identified the poorest 70 municipalities based on the average height-for-age of children in first grade.[81] These municipalities were then categorized into five strata based on the same variable and, within each stratum; municipalities were randomly allocated to four program evaluation groups (i.e. demand- and supply-side transfers – 20 municipalities, demand-side transfers only – 20 municipalities, supply-side transfers only – 10 municipalities, and 20 control municipalities). All households with children less than 13 years or with a pregnant woman were considered eligible for the program.

As part of the evaluation, a randomly selected sample of households was surveyed before and after the program intervention. This survey contains information on 5,484 households from the 70 municipalities covered by the program evaluation (i.e. 80 households per municipality). Households from 20 of these municipalities were eligible to cash transfers conditioned on attendance at school and health clinics, 10 were eligible for only increased investments in schools and health clinics, 20 were eligible to transfers and supply-side investments, and 20 were not eligible to any component of the program and were used as a control for the purposes of program evaluation. The survey questionnaires were implemented between August-December 2000 (baseline) and June-September 2002 (follow-up). The surveys contain sixteen modules (including information on household conditions, household composition, remittances, education, expenditures, maternal/child health, anthropometrics, women/child time use, quality of schools/clinics, other programs, goods/animals, community survey) containing over 500 variables. In this paper we will focus on three outcome variables, namely total household consumption, food consumption and labor supply decisions.

Two features of the data collection process have important implications for the way in which we analyze the impact of the program on consumption and labor supply across coffee and non-coffee households. Firstly, the baseline and follow-up surveys were collected at different times of the year, with the 2000 baseline being collected over the months August to December and the 2002 follow-up survey collected over the months June to September. Secondly, for operational reasons, the baseline survey was implemented first in the treatment municipalities (i.e. in those where households were later to receive cash transfers). Both these timing discrepancies mean that great care needs to be taken when comparing differences in consumption (and other) outcomes across program treatment/control groups as well as over time. We will address such issues in more detail below.

[81] See the Appendix A for a more detailed discussion of the program and survey design.

4. Data Description and Coffee Involvement

In the dataset, we have 5,484 households in the baseline survey. The survey includes two sets of variables we could use to classify households into coffee/non-coffee households:

(i) A question that asks if a household has land and, if so, how much of this is devoted to coffee. This question is asked only in the 2002 follow-up survey and is in a module relating to landholdings and their allocation in 2001.

(ii) A question in each survey asking how each working individual's time was allocated between various activities over the seven days prior to the survey, including coffee-related activities mainly referring to coffee-harvesting activities.

With respect to the second question relating to involvement in coffee activities, since the coffee harvesting season covers the months September-November, in the follow-up survey over June-September households are much less likely to report involvement in coffee activities since it is prior to the harvest. This is not the case in the baseline survey over August-December, which covers the harvest season. Therefore, one cannot gain any insights, other than possibly about seasonal patterns, from comparing the extent of households labor involvement in coffee-related activities across survey rounds. The different seasonal timing of the surveys thus means that one expects labor activity to be greater in the baseline survey.

We start by examining the pattern of coffee involvement in the program region. For this purpose we categorize sample households into four categories according the amount of land they own: landless, small holders with one manzana or less, medium holders with 5 manzanas or less, and large holders with over 5 manzanas. From Table 1 we can see that 30% of households are landless, 23% are small holders, 29% are medium holders, and 18% are large holders. As indicated earlier, because of the different timing of the surveys we expect to observe less labor activity in coffee in the follow-up survey and this is indeed borne out in Table 1 with 24% of households reporting labor activity in coffee in the baseline survey and only 11% reporting such activity in the follow-up survey. In both cases, the incidence of labor activity is highest amongst households with land and also slightly higher for large holders.

In Table 1 we can also see that the proportion of households with land reporting some land allocated to coffee is quite high at 42%, ranging from 39%-44% across the three land size categories. Below we use two definitions of a "coffee household". In the first, we simply use a binary variable that indicates whether or not a household has some land devoted to coffee. From Table 1 we see that 42% of households with land report having some land devoted to coffee. In the second, we use a binary variable that indicates whether or not a household lives in a coffee cluster, i.e. in a cluster where at least one household reports having some land devoted to coffee production. This is obviously a much broader definition of a coffee household and 76% of households are classified as coffee households under this definition (Table 1). To the extent that labor hiring for coffee activities is local, one expects the additional households incorporated under the second definition to include coffee laborers. Note also that, under this definition of a coffee household, there is no substantial difference in the proportion thus involved in coffee across landless households or households with different land holdings. Below we will refer to these distinct groups "coffee land", "other coffee", and "non-coffee" households.

Table 1: Extent of coffee involvement by size of landholdings.

Landholding Category	Share of Households	Labor Activity 2000	Labor Activity 2002	Have Land Under Coffee	In Coffee Cluster
Landless	0.30	0.18	0.06	-	0.72
<=1 manzana	0.23	0.26	0.12	0.44	0.80
<=5 manzana	0.29	0.26	0.12	0.39	0.74
>5 manzanas	0.18	0.29	0.14	0.43	0.81
Total	1.00	0.24	0.11	0.42	0.76

Table 2a presents the some descriptive statistics for those with land under coffee, those without coffee land but living in "coffee clusters", and the remaining "non-coffee" households – see below for more discussion on these definitions. Those households growing coffee have larger household size, more adult household members, are less likely to have a female head of household, and have higher total consumption and food consumption. Table 2b presents the results of a probit regression where the dependent variable indicating whether or not a household allocates some land to coffee, conditional on having land. The coefficients indicate that households with land on a hillside are more likely to allocate land to coffee as are households where the head has secondary education. Also, those with larger farm holdings are also more likely to allocate land to coffee. Characteristics such as household size, number of adult males, gender of head of household and age of head do not show up as being significantly associated with the decision to allocate land to coffee.

Table 2a: Descriptive Statistics by Coffee/Non-Coffee Classification.

	Coffee Land	*Other Coffee*	*Non Coffee*
Household size (persons)	5.84	5.49	5.79
Persons<=6years	1.20	1.23	1.27
7<=Persons<=10	0.91	0.88	0.95
11<=Persons<=19	1.21	1.04	1.15
20<=Persons<=49	1.87	1.76	1.73
50=Persons<=64	0.44	0.37	0.45
Persons>=65	0.21	0.21	0.24
Age of head	45.1	44.0	45.6
Female head	0.15	0.21	0.19
Head has no education	0.26	0.26	0.26
Head has primary education	0.65	0.67	0.69
Head has secondary education	0.05	0.04	0.03
Total landholdings (ha)	22.6	25.5	18.5
Per capita landholdings (ha)	4.64	5.40	5.17
Per capita total daily consumption (2000 lempiras)	22.2	19.5	18.0
Per capita food daily consumption (2000 lempiras)	13.0	12.2	12.2
Number of households	1597	2220	1213

Note: Coffee Land indicates household has some land under coffee; Other Coffee indicates household does not have land under coffee but lives in a cluster where at least one household does have land under coffee; Non-Coffee indicates households not in first two categories.

Table 2b: Probit regression of having land under coffee on household socioeconomic characteristics.

pweight: <none> — Number of obs = 3836
Strata: estrato — Number of strata = 5
PSU: psuvar — Number of PSUs = 70
Population size = 3836
F(12, 54) = .
Prob > F = .

landcafe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
hhpop	.0018625	.0075771	0.25	0.807	-.0132701	.0169951
males19to48	.055491	.0354913	1.56	0.123	-.01539	.1263721
agehead	.0002706	.0016448	0.16	0.870	-.0030142	.0035555
prek_educh	.454092	.1401117	3.24	0.002	.1742696	.7339145
prim_educh	.0107267	.0568927	0.19	0.851	-.102896	.1243493
sec_educh	.6376881	.1570427	4.06	0.000	.3240522	.951324
univ_educh	.6764243	.4220368	1.60	0.114	-.1664414	1.51929
oth_educh	-.0601485	.3535989	-0.17	0.865	-.7663344	.6460373
sexhead	.0202212	.0739746	0.27	0.785	-.1275163	.1679587
cerro	.2194553	.0814588	2.69	0.009	.056771	.3821397
mland	.0407188	.0602937	0.68	0.502	-.0796961	.1611337
lland	.2041131	.0796879	2.56	0.013	.0449653	.3632609
land_forest	-.0207995	.0077738	-2.68	0.009	-.0363249	-.0052741

Note: Regression also includes municipality dummies and standard errors are corrected for sample design.

5. Coffee and Consumption

Table 3 presents data on the pattern of the change in total household per capita consumption and household per capita food consumption across coffee and non-coffee households.[82] Overall, we observe a 16% decline in total real per capita consumption levels between 2000 and 2002. It is also noteworthy that households with coffee land experience a substantially larger 20% decline, compared to a 16% decline for other-coffee households and a 12% decline for non-coffee households.

Table 3: Consumption changes across coffee and non-coffee households.

			% Change in Per Capita Household Consumption	
	Sample Size	Sample Share	Total	Food
Coffee Land	1597	0.32	-0.20	-0.16
Other Coffee	2220	0.44	-0.16	-0.13
Non Coffee	1213	0.24	-0.12	-0.09
Total	5030	1.00	-0.16	-0.13

The final column presents the change in (real) per capita food consumption across household groups. In aggregate, per capita food consumption decreases by 13%. A similar pattern of changes is observed across household categories, with coffee-land households experiencing a 16% decline, other-coffee households a 13% decline, and non-coffee households experiencing only a 9% decline.

In Table 4 we present the percentage change in real consumption by economic quintile grouping. Because consumption is measured with a substantial amount of error (or, equivalently, has a large transitory component), we use an asset index as our proxy for "permanent" (or long-run) household income. The first column of numbers shows the ratio of mean per capita total consumption to that of the lowest asset quintile. Although all in these communities may be perceived as being poor, they are obviously not equally poor. For example, the consumption of the most asset-rich group is over 2.5 times that of the most asset-poor group.

[82] Total household per capita consumption is in real terms using the change in the exchange rate changes as our proxy for inflation. Note that although one cannot sensibly compare changes across program groups because of the different survey timing, this is not the case for comparisons across coffee/non-coffee groups since these are distributed uniformly across survey periods. However, the timing differences between the survey rounds (as well as within the baseline) means that the time pattern contains an element of seasonality. For this reason we focus more on relative changes across groups.

Table 4: Consumption Changes and Coffee Intensity By Economic Quintiles.

		%Change Consumption 2000-2002			
	Consumption Ratio	Per Capita Total	Per Capita Food	Coffee Land	Coffee Cluster
Asset Quintiles					
Low	1.00	-0.11	-0.09	0.23	0.77
2	1.09	-0.17	-0.11	0.27	0.74
3	1.21	-0.15	-0.12	0.32	0.74
4	1.51	-0.19	-0.15	0.32	0.74
High	2.52	-0.18	-0.16	0.43	0.81

Note: Consumption is in real 2000 prices.

The next two columns present the percentage change in per capita total and food consumption over the two-year period 2000-2002. In the case of total per capita consumption, all groups exhibit large declines although the decline is somewhat smaller for the poorest quintile. In the case of food consumption, all households experience a decline with this decline being higher for more asset-rich households. The final two columns describe the coffee-intensity of the different asset quintiles. The asset-rich households are clearly more coffee-intensive in terms of having land devoted to the crop. However, with the broader definition of coffee intensity, we observe less differences across asset quintiles suggesting that any adverse coffee shock may affect all households adversely.

6. Modeling the program impact on consumption and crisis mitigation

In this section we take a more structural approach and investigate the impact of the drop in coffee prices and the cash transfer program on household allocation decisions and expenditure outcomes. We do so by studying the channels via which the drop in coffee prices may have affected household expenditures and labor allocation, and identifying the impact of transfers in mitigating the shock.

In Appendix B, we develop a theoretical model do guide our empirical analysis. As described in the appendix, the key result of the model is that household's response to an unexpected coffee price shock will depend on their access to credit, and the additional cash from the program will only impact their allocation decisions if they are credit constrained. Intuitively, we expect the impact of a shock to depend on the ability of households to smooth consumption over time. Since access to credit is a key factor in a household's ability to smooth consumption, we expect responses to shocks to depend on whether or not the household has access to credit. Having access to credit allows the household to smooth consumption so that we would not expect a shock to impact much on either consumption or production decisions of these households. Without access, households may have to decrease consumption and reallocate labor off-farm (i.e. away from on-farm coffee investment activities, e.g. maintaining coffee trees) in order to support current consumption levels.

Therefore, cash transfers should not affect the labor supply of credit-unconstrained households, but they are likely to induce credit-constrained households to supply more labor to maintaining coffee trees. So, for these credit-constrained households, the program's cash transfers should have both a substitution (i.e. due to conditioning) effect and a liquidity effect on labor allocation decisions. Accordingly, credit-unconstrained households would not need to generate as much

additional current income to smooth consumption as credit constrained-households would because they can borrow freely. Therefore, they would sell less labor off-farm and would be able to better maintain their coffee trees than credit-constrained households. This would result in a higher shadow value of coffee land for credit-unconstrained households. We test these two implications of the model below.

6.1 Transfers, credit constraints and labor allocation on coffee farms

We first test the implications of the theoretical model for the household's decision to supply labor to coffee related activities. Ignoring the conditionalities of the program transfers for a moment, the model presented in the appendix suggests the following relationship between labor supply to coffee activities and access to cash transfers:

$\frac{\partial l^c}{\partial \tau} = 0$, if the household is liquidity unconstrained;

$\frac{\partial l^c}{\partial \tau} > 0$, if the household is liquidity constrained,

where l^c represents the number of hours supplied by the household to coffee related activities in the last 7 days, and τ is the amount of cash received by the household. Hence, without conditionalities, cash transfers would only impact labor allocation via a liquidity effect on credit-constrained households.

Under the conditionality of the program, however, children aged 6-13 of beneficiary households need to be attending school to ensure continued eligibility of the household. This may result in a drop on the supply of labor from these children, and a simultaneous increase in the supply of labor to coffee related activities from members older than 13. Thus, such conditional cash transfers (CCTs) may affect labor allocation of adults via both a liquidity effect and a labor substitution effect.

In the analysis that follows we econometrically estimate two labor supply equations to test the implications of the model above: the first for hours worked in coffee related activities by household members 14 and older, and the second for children aged 6-13. For the dependent variable we use the information on the main activity performed by each member of the household six years of age and older. We only include activities related to maintaining coffee trees, weeding and fertilization of coffee land, and exclude activities related to harvesting coffee. We do so because the former is more likely to respond to price shocks and cash transfers that affect current consumption since they represent investment for future consumption. Since harvest related activities can be transformed into cash for current consumption more easily, we only estimate the labor supply equations for the data collected in 2002 (because of the timing of the surveys, more of the labor activities reported in 2000 relate to harvesting activities).

As for determining whether the household was credit unconstrained or constrained, we use the data for the application to formal and informal credit providers. Households that had <u>all</u> their credit applications denied were classified as credit constrained. So were households that did not apply to any credit provider, but reported that they would be denied credit from <u>all</u> providers if they had applied.

As for cash transfers, we use an indicator variable (dummy variable) that indicates whether the family was eligible or not for the program. We use eligibility instead of actual receipt because current labor supply to coffee activities is likely to be determined by whether the household expects to receive cash soon rather than whether they actually received cash in the past. This is especially important for the data collected in 2002 because the majority of the interviews were carried out concurrent with the distribution of cash in the region.

Table 5 below presents the results for the Tobit estimation of the two labor supply equations just described (see Appendix Table 1 for more detailed results). The estimates are for the sub-sample of coffee growers only (1756 households). This makes it more likely that the labor supply reported refers to work on their own land and not work provided to other farmers. Note first that the coefficients on the coffee land variables indicate that both adult and child labor allocated on-farm is significantly higher on larger coffee farms, the latter highlighting a potential conflict between investments in coffee land and investments in children's human capital.

The results for the labor supply of adult members (14 and older) indicate that there is no impact of the cash transfer on labor supply for credit-unconstrained households, as predicted by the theoretical model. This indicates that the conditionality of the program does not induce an increase in labor supplied to coffee activities by older members, that is, there is no substitution effect.

However there does appear to be some liquidity effect of transfers on adult labor supply in credit-constrained households – although this effect is significant only at the 10% level. Since the dependent variable is the log of hours, we need to manipulate the coefficients to derive the marginal impact. Let T_i be the dummy for treatment, C_i be the dummy for credit constrained households, and X_i other explanatory variables. Then our specification is:

$$\ln(y+1) = \beta T_i + \gamma T_i.C_i + \delta X_i + \varepsilon$$

so that,

$$y = e^{(\beta T_i + \gamma T_i.C_i + \delta X_i + \varepsilon)} - 1$$

and,

$$\frac{\partial y}{\partial T} = (\beta + \gamma C_i) e^{(\beta T_i + \gamma T_i.C_i + \delta X_i + \varepsilon)} = (\beta + \gamma C_i)(y+1).$$

Then the marginal impact is calculated as:

$$E\left[\frac{\partial y}{\partial T}\right] = (\beta + \gamma C_i) E[(y+1)]$$

From the regressions we have the mean value of (y+1) is 10.06, β=0.955 and γ=1.394. Therefore, for credit constrained households:

$$E\left[\frac{\partial y}{\partial T}\right] = (\beta + \gamma C_i) E[(y+1)] = (0.955 + 1.394) \times 1.5 = 3.27$$

That is, the transfer (or eligibility for it) seems to increase the supply of adult labor in credit constrained households to coffee activities by 3.27 hours per week. So even the small cash transfers given by PRAF do appear to slightly alleviate the liquidity constraints faced by some coffee growers and enable them to redirect their labor to short-term investments focused on maintaining the productivity of their coffee crops.

Table 5: Tobit estimates of coffee-related labor supply by coffee growers.

Explanatory Variables:	*Hours supplied by persons 14 and older*	*Hours supplied by children aged 6 to under 14*
Area under coffee (manzanas)	0.215**	0.926**
	(0.048)	(0.303)
Area under coffee squared	-0.004**	-0.025*
	(0.001)	(0.012)
Dummy=1 if credit constrained	-0.455	0.243
	(1.081)	(2.682)
Eligible for transfer	0.955	-2.274
	(0.567)	(2.414)
Eligible for transfer X credit constrained dummy	1.394	-21.153**
	(1.511)	(2.693)
Observations	1756	1756

Note: Dependent variable is log of (labor hours plus one). Regressions also include education of household head, household composition, land elevation, location; these results are presented in Appendix table 1. Standard errors in parentheses:+ significant at 10%; * significant at 5%; ** significant at 1%

The results in the second column also indicate that the liquidity effect is more important than the substitution effect induced by the conditionality of transfers. As the results indicate, it seems that the conditionality of the transfer is not affecting the labor supply to coffee activities of the young in credit-unconstrained households. This is consistent with, for example, children from unconstrained households only working on such activities outside of school hours. It is also consistent with the results of the estimated impact of PRAF on enrollment, which suggest that enrollment rates for children aged 6-13 are quite high, especially for higher income households (Glewwe and Olinto, 2004).

However, additional liquidity to credit-constrained households does induce a lower supply of labor by children to under 14 to coffee related activities. From the regressions we have the mean value of (y+1) is 1.499, β=-2.274 and γ=-21.153. Therefore, for credit constrained households:

$$E\left[\frac{\partial y}{\partial T}\right] = (\beta + \gamma C_i)E[(y+1)] = (-2.274 - 21.153) \times 1.5 = -35.14$$

That is, the transfer (or eligibility for it) seems to decrease the supply of child labor to coffee activities by about 35 hours per week. Since on average households have 1.41 children aged 6 to 13 this implies an average decrease of nearly 25 hours of work per child per week. This decrease in labor supply by children is quite substantial and one would therefore expect a corresponding increase in time allocation elsewhere, e.g. more time in school. However, the evaluation of the program impact on education outcomes indicates that enrollment rates increased by only 2.6 percentage points as a result of the program, absenteeism decreased by just under 2 days per month, the probability of a child dropping out of school decreased by around 6 percentage points, and there was no evidence of any statistically significant program impact on child labor force participation (Glewwe and Olinto, 2004). In total, the program is expected to increase the schooling of 14 year olds in poor rural Honduras by 0.7 years. In nearly all cases, the beneficial educational impacts were substantially higher for the poorest households. One interpretation of the above results is that the decrease in coffee labor time by children in households that are

credit constrained results both in an increase in time at school but, more importantly, in an increase in the time available to children either for education activities in the home or leisure.

Thus, together the results from both equations suggest that the extra liquidity provided by transfers is helping cash constrained coffee growing households cope with the coffee crisis maintain their coffee trees productive without compromising the schooling of their young. That is, transfers seem to be helping coffee households maintain their investment in human capital despite the likely effect of sharp drop in prices on current consumption.

6.2 CCTs, credit constraints and household expenditures

We now look at the channels through which conditional transfers may have impacted per-capita expenditures (PCE) of coffee and non-coffee households in western Honduras. As indicated by the model presented in Appendix B, there are three channels via which transfers may have impacted PCE. First, as indicated by the analysis of the impact of transfers on labor supply presented above, PRAF beneficiaries may have been better able to maintain the productivity of their coffee land by selling less labor off-farm and investing more on coffee tree maintenance, soil fertilization and weeding. This investment effect would translate into a higher shadow value of coffee land for transfer beneficiaries. Secondly, transfers may have provided sufficient additional income to compensate for the drop in coffee prices. This would be a direct income effect of transfers, which could be stronger for coffee farmers since they have suffered a coffee price reduction. Finally, transfers may have provided sufficient liquidity to credit-constrained coffee farmers thus allowing them to smooth consumption.

Table 6 presents the results of an instrumental variable estimation of a PCE function on several household and municipality characteristics, including whether the household is credit constrained, whether it received transfers from PRAF, and whether it owns coffee land. For transfers we use a dummy indicating take up of the program and not just eligibility. Given that take up is likely to be endogenous, we instrument it with the exogenous eligibility variable. The regressions also include municipal dummies to control for municipal level effects.

Table 6: IV estimation of the per-capita expenditure (PCE) functions for 2002 and 2000.

	PCE in 2002	PCE in 2000	2002 - 2000
Received CCT	***0.038***	***-0.031***	***0.068***
	(0.057)	***(0.048)***	***(0.075)***
Received CCT X area under coffee (manzanas)	***0.008***	***0.010***	***-0.003***
	(0.010)	***(0.008)***	***(0.013)***
Received CCT X credit constrained dummy	***0.061***	***-0.010***	***0.071***
	(0.069)	(0.057)	(0.089)
Dummy=1 if household head has incomplete primary	0.109**	0.150**	-0.041
	(0.019)	(0.021)	(0.028)
Dummy=1 if household head completed primary	0.414**	0.409**	0.005
	(0.032)	(0.035)	(0.048)
Dummy=1 if household head has incomplete secondary	0.815**	0.770**	0.045
	(0.053)	(0.069)	(0.087)
Dummy=1 if household head completed secondary	1.155**	1.206**	-0.051
	(0.066)	(0.069)	(0.095)
Dummy=1 if hh head has some post secondary schooling	1.355**	1.146**	0.209
	(0.107)	(0.110)	(0.153)
Log of household population	-0.425**	-0.336**	-0.088*
	(0.028)	(0.026)	(0.038)
Area under coffee (manzanas)	***0.034****	***0.030****	***0.004***
	(0.007)	***(0.005)***	***(0.008)***
Non coffee land area (manzanas)	***0.002+***	***0.001***	***0.001***
	(0.001)	***(0.001)***	***(0.001)***
Dummy=1 if household is credit constrained	***-0.095+***	***-0.056***	***-0.038***
	(0.048)	(0.035)	(0.060)
Share of household population under 6	-0.932**	-0.876**	-0.056
	(0.073)	(0.078)	(0.107)
Share of household population 6 to under 10	-0.639**	-0.695**	0.056
	(0.079)	(0.101)	(0.128)
Share of household population 10 to under 14	-0.471**	-0.578**	0.106
	(0.087)	(0.093)	(0.127)
Share of household population 14 to under 18	-0.262**	-0.290**	0.028
	(0.077)	(0.077)	(0.109)
Share of household population 40 to under 60	-0.056	-0.003	-0.052
	(0.048)	(0.064)	(0.080)
Share of household population 60 and above	-0.371**	-0.310**	-0.061
	(0.060)	(0.066)	(0.089)
Minutes walking to closest public transportation	-0.002**	-0.001**	-0.000
	(0.000)	(0.000)	(0.000)
Days from May 1st	-0.002	-0.015	0.013
	(0.003)	(0.012)	(0.012)
Days from May 1st squared	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Elevation in meters above sea level	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Elevation in meters above sea level squared	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Constant	3.943**	4.771**	-0.952
	(0.197)	(0.934)	(0.948)
Observations	5663	10744	
R-squared	0.42	0.41	

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

The first column of the table presents results of the estimation using only the 2002 survey data. The second and third columns present the results from a regression that pools the 2000 and 2002 data, but interacts all variables with a dummy variable for 2002. This allows all parameters to change from 2000 to 2002, and allows us to test whether the shadow value of each variable has changed over the period.

The third column presents the coefficients of all interacted variables, i.e. the difference between the 2002 coefficients and the 2000 coefficients presented in the second column. As can be seen, the only coefficient that seems to significantly change from 2000 to 2002 is the coefficient on "*Log of household population*". However, a joint Wald test cannot reject the null hypothesis that all interaction coefficients are zero (P-value = 0.76). Therefore, we focus the discussion on the results for 2002 presented in the first column.

As can be seen in the first column, PRAF transfers seem to have no direct income effect on current PCE. Also, while credit constrained households do appear to spend less per-capita (at the 10% significance level) than unconstrained households, the transfers given by PRAF do not seem sufficient to induce higher levels of consumption, that is, there seems to exist no liquidity effect of transfers on PCE. This indicates that the liquidity effects found in the labor supply analysis are not enough to affect current consumption and that the adult and child labor effects are likely to cancel out.

Finally, although the returns to coffee land appear to be higher relative to non-coffee land, the results also indicate that there is no effect of transfers on the shadow value of coffee land. Thus, it seems that the investment effect described in the previous section is not sufficiently large to affect the productivity of coffee land in 2002. For such effects to emerge it is likely that the size of the cash transfer needs to be considerably larger.

7. Concluding Remarks

In this paper we have described the nature of coffee involvement in some of the poorest rural municipalities in western Honduras. Our analysis indicates that the region is very coffee intensive with a large proportion of land devoted to coffee. We found that households with larger landholdings are more likely to be involved in coffee as are households whose heads have greater than primary education. Also, hillside farms are more likely to grow coffee.

Our analysis of the consumption data provides a picture of the change in total household consumption over the period 2000 to 2002, a period when households were hit with two economic shocks, namely, a drought and a continuing decline in international coffee prices. We find that the percentage decreases in total household per capita consumption and in per capita food consumption are highest for households with coffee land, followed by households living in coffee clusters who are likely to rely indirectly on the coffee economy.

In the second half of the paper we evaluate the impact of a transfer program implemented in the area over the period on labor supplied to coffee related activities and on household per-capita expenditures. It is noticeable that household labor time of both adults and children appear to be substantially higher on larger coffee farms, the latter highlighting a potential conflict between investments in coffee land and investments in the human capital of children. Our results indicate that the cash transfers given out by PRAF, which are also conditioned on keeping kids in school, have significantly affected the labor allocation decision of credit-constrained coffee farmers. The additional liquidity provided by the transfers seems to have allowed families to maintain their children in school and increased the time dedicated by adults to maintaining coffee trees. In other

words, the fact that the transfers have been conditioned on investments in child education seems to have ensured that higher on-farm investment labor activities have not come at the expense of investments in children's human capital.

The results from the per-capita expenditures regressions also indicate that, although credit-constrained households have lower consumption levels, the transfers may not have been large enough to increase current consumption of either credit-constrained or unconstrained households. This is not surprising since the program was designed to induce human capital accumulation by simply covering the opportunity cost of children's time. It was not intended to increase current household expenditure and reduce current poverty. It seems however that an increase in the amounts transferred would provide much needed current poverty alleviation and could possibly contribute further to alleviating liquidity constraints of poor households.

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Appendix A: Program and Survey Design

The evaluation experiment was conducted in 70 municipalities in the west of Honduras with a total population of 660,000 in 2001 [Instituto Nacional de Estadística, 2002]. The municipalities were selected because they had the highest prevalence of malnutrition in the country according to a height census of first-grade primary school children conducted in 1997 [Government of Honduras, 1997]. For some benefits (see below), eligibility was restricted to households whose residence in a particular municipality had been recorded in a special census of the area conducted in mid-2000.

Two packages of conditional cash transfer interventions were planned and implemented in this area by the program. The first, which we term the *health and nutrition package*, was a cash transfer paid to pregnant women and women looking after children less than three years of age in households of established residence. Each eligible household received up to a maximum of two freely exchangeable vouchers worth 55 Lempiras per beneficiary per month. The second package, the *educational package*, was targeted to households with children 6 to 12 years of age (inclusive) enrolled in primary school in grades one through four. These received up to three vouchers worth 80 Lempiras per beneficiary per month for ten months of the year.

The vouchers were distributed on three occasions between the baseline and post-intervention surveys reported here: in November of 2000, and in May/June and October/November of 2001. A fourth round of voucher distribution coincided with the post-intervention survey in 2002. The payments were conditional in that all beneficiaries were informed that their payments would be suspended if they did not keep up to date with routine ante-natal care and preventive health care for children under three, and the school enrolment and minimum attendance requirement (85% of classes).

The total number of trial municipalities was determined by the budget available to the program. Because the entire population of each municipality could be receiving program benefits, it was necessary to restrict data collection activities to a representative sample of households in each municipality. Sample size calculations took into account the cluster-randomization, and were based on an *ex-post* comparison of 20 intervention and 20 control municipalities, with 80% power to detect a significant difference (P=0.05, two-sided). We used the formula presented by Murray [1998; 368-9] for group-randomized trials with repeat observations of groups. The final size of the evaluation cohort was eighty households per municipality.

The representativeness of the evaluation cohort at the municipality level at baseline was ensured by: (i) randomly sampling eight census enumeration areas in each municipality with probability proportional to size; (ii) mapping all the dwellings in the enumeration area and numbering them consecutively; (ii) choosing a random start-point, and conducting interviews in ten consecutive inhabited dwellings following the direction of the numbering on the map. The same households were interviewed in the post-intervention survey. Women and young children in these households who had moved in the intervening period were followed up in their new homes (referred to as 'derived' households), provided these were located in one of the seventy trial municipalities or an adjacent one.

Each of the seventy municipalities was randomly assigned to one of four groups: (a) the household-level demand-side package alone, (b) the supply-side package, (c) both packages, and (d) control group. Before randomization, the municipalities were stratified into five groups of fourteen on the basis of the prevalence of stunting reported in the 1997 school height census

[Government of Honduras, 1997]. Within each stratum, municipalities were randomly allocated to the various evaluation groups.

The randomization was carried out by children in the presence of legal authorities and representatives of Honduras' agency for administrative probity. The aperture of the box was sufficiently small that once the child had inserted his/her arm, it was impossible for him/her to see the colored balls. From the day of the randomization onwards, there was no attempt to conceal the allocation. Because of the 2000 residence requirement, no household could become eligible for the cash transfers by moving house after randomization.

Appendix Table 1: Tobit estimates of coffee related labor supply by coffee growers.

Explanatory Variables:	*Hours supplied by persons 14 and older*	*Hours supplied by children aged 6 to under 14*
Area under coffee (manzanas)	0.215**	0.926**
	(0.048)	(0.304)
Area under coffee squared	-0.003**	-0.025+
	(0.001)	(0.013)
Dummy=1 if credit constrained	-0.456	0.243
	(1.08)	(2.682)
Eligible for CCT	0.955+	-2.274
	(0.567)	(2.414)
Eligible for CCT X credit constrained dummy	1.394	-21.153**
	(1.51)	(2.693)
Household population under 6	-0.158	0.131
	(0.186)	(0.584)
Household population 6 to under 10	0.191	1.679*
	(0.250)	(0.724)
Household population 10 to under 14	-0.190	1.934**
	(0.220)	(0.466)
Household population 14 to under 18	0.389+	1.088+
	(0.230)	(0.523)
Household population 18 to under 40	0.989**	-0.390
	(0.166)	(0.544)
Household population 40 to under 60	0.646**	-0.079
	(0.274)	(0.666)
Household population 60 and above	-0.069	-2.188*
	(0.307)	(0.841)
Dummy=1 if household head has incomplete primary	0.145	-0.025
	(0.418)	(1.022)
Dummy=1 if household head completed primary	-0.292	-3.785*
	(0.497)	(1.778)
Dummy=1 if household head has incomplete secondary	-2.146*	-24.306**
	(1.088)	(2.695)
Dummy=1 if household head completed secondary	-2.058	-24.471**
	(1.470)	(1.948)
Dummy=1 if hh head has some post secondary schooling	-21.273**	-22.603**
	(0.978)	(1.709)
Elevation in meters above sea level	0.015*	-0.004
	(0.006)	(0.131)
Elevation in meters above sea level squared	-0.000*	0.000
	(0.000)	(0.000)
Constant	-15.086**	-34.993**
	(4.18)	(8.996)
Observations	1756	1756

Note: Dependent variable is log of (labor hours plus one). Standard errors in parentheses: + significant at 10%; * significant at 5%; ** significant at 1%. Regressions also include municipality dummies as explanatory variables.

The coffee crisis: a short note on Guatemalan farmers

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Introduction

The worldwide structural change of the coffee industry is seriously affecting Guatemala. Coffee has always played an important role for the Guatemalan economy. It is the most important export of the country with receipts of more than $570 million in 2000 (20 percent of total export earnings).[83] In fact, Guatemala is the fifth largest coffee exporter in the world. The coffee sector provides both permanent and temporary employment to thousands of people, many of them poor.

Nonetheless, the recent entry in coffee production from a number of countries (particularly Vietnam), as well as above average yields in some Latin American countries (such as in Brazil) have severely depressed coffee prices, resulting in significantly lower revenues for coffee producers in Guatemala.

This note explores cross sectional data to evaluate how coffee farm households in Guatemala may have been affected by the crisis and what mechanisms they have employed to mitigate its impact. Despite the fact the data are static in nature, information on shocks experienced by the households as well as coping strategies employed to mitigate their effect is used to partially address the question of the impact of the crisis on coffee farm households.

To summarize the findings, the data reveal that coffee farmers in the ENCOVI 2000:

- comprise about 10 percent of the rural population;
- are mainly small-scale coffee producers;
- are significantly poorer compared to their regional non-coffee counterparts;
- during 2000, they were more likely to experience adverse shocks, resulting in income and assets loses;
- used a number of coping strategies to mitigate the impact of these shocks including increases in labor supply, depleting savings and decreases in consumption patterns.

The next session briefly describes the data and coffee definition used in the note, followed by a profile of coffee-farmers, and an overview of welfare trends and income portfolios. An examination of coping strategies employed by coffee farmers is presented in the next section, while the last session concludes.

[83] World Development Indicators (2001).

The ENCOVI 2000, sample structure and coffee farmers

The main source of quantitative information used in this work is the Living Standards Measurement Survey (ENCOVI-2000). The ENCOVI, executed by the Guatemalan National Institute of Statistics (INE), covers a sample of about 7,300 households and is statistically representative at the national level and for a number of strata including: (a) urban and rural areas; (b) eight regions (and urban and rural areas in these regions).

While the survey allows identification of coffee farm households, it does not permit identification of coffee laborers. Unfortunately, there was no question that distinguishes wage earners in the coffee sector. Nonetheless, the self-employment section includes information on crop production and as such the identification of farm households that produce coffee is possible. It is important to note that because the ENCOVI is a household survey, plantations owned by entities other than households (such as corporations or banks) are not captured in the data collected in the survey. As such, the estimates presented here are not representative for all coffee producers.

The ENCOVI 2000 data reveal that seven percent of all households produce coffee (Table 1). This corresponds to about 160,000 farm households that receive income from coffee production. Distinguishing between urban and rural areas, two percent of urban households are coffee farmers while 11 percent of rural households produce coffee (Figure 1).[84] Since it is very likely that welfare differences exist between urban and rural households, we report the findings separately for the two groups.

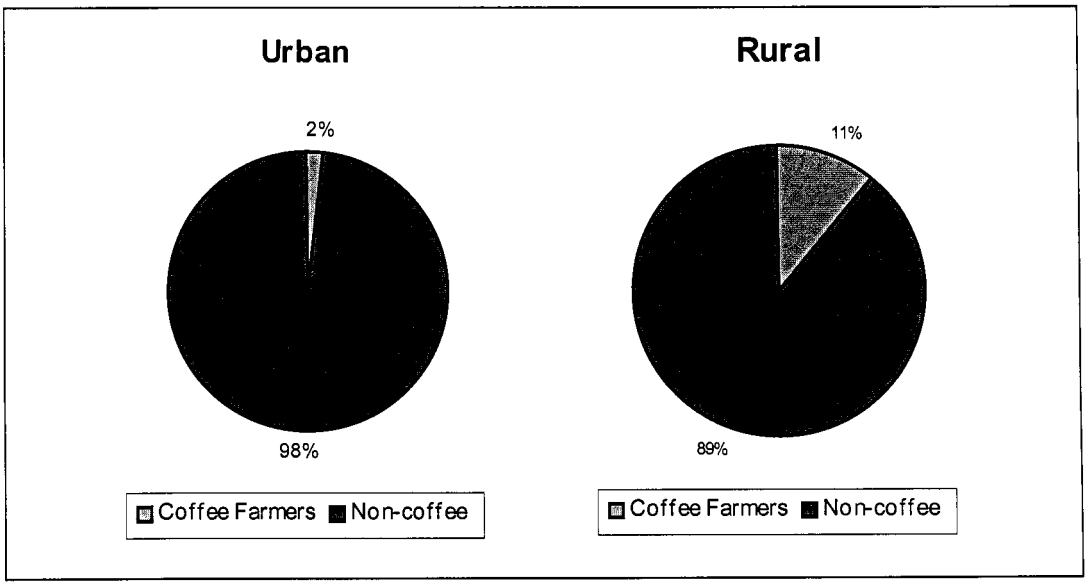
Table 1: Samples structure: household coffee farmers.

	Urban	Rural	All
Number of households producing coffee	21,171	138,424	159,595
% of households producing coffee	2	11	7
Sample size	123	467	590

Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística - Guatemala.

[84] It is important to note that, because the ENCOVI is a *household* survey, plantations owned by entities other than households (such as corporations or banks) are not captured in the data collected in the survey. As such, the estimates presented here are not representative for all coffee producers.

Figure 1: Sample structure: coffee farmers and non-coffee households.



In addition, the regional distribution of coffee farmers suggests that there is a strong concentration in terms of coffee production. Specifically, almost 80 percent of the coffee farmers in the survey reside in 3 regions: Norte, Suroriente and Noroccidente (Table 2). In fact, coffee farmers in each of these regions comprise more than 20 and in the case of Norte more than 30 percent of the household population within each of these regions, indicating the strong geographic concentration of coffee production.

Table 2: Samples structure: coffee-farm households (%), by region.

	Across	Within	Poverty rate (%)
Metropolitana	3	0.1	18.0
Norte	30	30	84.0
Nororiente	2	2	51.8
Suroriente	23	19	68.6
Central	7	5	51.7
Suroccidente	9	3	64.0
Noroccidente	26	17	82.1
Peten	0.1	0.4	68.0
Total	100		56.2

Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística - Guatemala.

Who are the coffee farmers

There are a number of differences between urban and rural coffee farmers. For example, rural coffee farmers have larger families, are more likely to be indigenous and have significantly lower levels of education compared to their urban counterparts (Table 3). In addition, rural farmers own less land than urban coffee farmers, and are less likely to rent additional land (Table 4).
Still, most coffee farmers in the survey are small-scale landowning households irrespective of the area of residence. More than 88 percent of rural and 96 percent of urban coffee farmers own land (Table 4). For rural coffee farm households, the average land holdings are 2.7 hectares (3.1 among landowners). This compares with 3.6 hectares (3.8 among landowners) for urban coffee farmers.

Table 3: Household characteristics.

	Urban		Rural	
	Non-coffee	Coffee	Non-coffee	Coffee
Household composition				
# of children (<14 years)	1.8	1.9	2.7	2.9
# of adults (15-60 years)	2.5	2.9	2.6	2.8
# of adults (>60 years)	0.3	0.5	0.4	0.4
Household size (number)	4.6	5.3	5.7	6.1
Indigenous (%)	25	41	48	59
Household head is male (%)	77	87	84	92
Household head education (years)	6.5	5.7	2.3	1.6
Migrant in the household (yes=1)	9	13	12	12
Household members would like to work more (%)	68	69	76	82

Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

Table 4: Land use.

	Urban		Rural	
	Non-coffee	Coffee	Non-coffee	Coffee
Land ownership (%)	10	96	46	88
Tenants	4	4	19	12
Average land owned (hectares)	0.2	3.6	1.3	2.7
Average land owned among landowners (hectares)	1.6	3.8	2.8	3.1
Average land rented in (hectares)	0.1	1.1	0.4	0.4
Average land rented in among renters (hectares)	0.7	3.3	1.0	0.8

Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

Perhaps the most striking difference between urban and rural households is the fact that while urban coffee farm households are relatively not poor, rural coffee farmers have high poverty incidences. Specifically, only one third of coffee farmers in urban areas are classified as poor (Table 5). This compares with more than 77 percent among rural coffee farmers. Interestingly, both poverty rates are significantly higher compared to the average poverty rates for rural or urban areas respectively. This is also true for regional poverty rates comparisons, where the 3

regions where 80 percent of the coffee farmers in the survey reside have higher poverty incidences than any other region (Table 2).

Welfare comparisons: coffee farmers versus non-coffee households Poverty and consumption

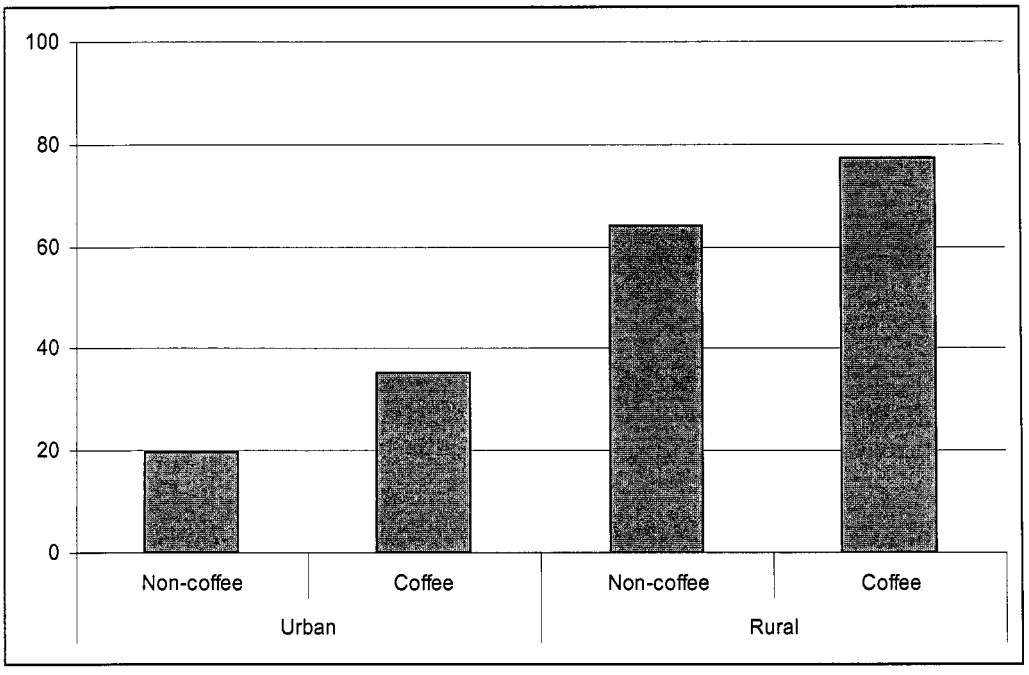
As discussed above, poverty rates among rural coffee farmers in 2000 were higher than urban coffee farm households. Still, compared with their regional counterparts, coffee farm households had higher poverty rates than non-coffee households. For example, the headcount ratio in urban areas for coffee farm households is 35 percent compared to only 20 for non-coffee households (Table 5 and Figure 2). In addition, comparing households in rural areas (where poverty is extensive), coffee farm households have a poverty rate of 77 percent while non-coffee of 64 percent. Similar patterns emerge using extreme poverty indicators.

Table 5: Household welfare indicators, by coffee.

	Urban		Rural	
	Non-coffee	Coffee	Non-coffee	Coffee
Poverty rate (%)	19.6	35.3	64.1	77.3
Extreme poverty rate (%)	1.6	2.2	17.2	22.4
Annual consumption per capita (in quetzales)	12,194	9,467	4,459	3,584
Overall	27.1		74.5	

Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

Figure 2: Poverty headcount rates.



Reflecting the poverty measures above, consumption per capita patterns also show similar differences. For example, consumption per capita in rural areas is more than 30 percent higher for non-coffee households (Table 5). In urban households consumption per capita among coffee farm households was Q9,500 compared to more than Q12,100 among non-coffee households.

Incomes and income portfolios

As the previous patterns suggest, coffee farmers in the ENCOVI 2000 were poorer compared to their regional-specific non-coffee counterparts. As expected, income trends suggest similar patterns. Specifically, incomes per capita among coffee farmers in both urban and rural areas were about 10 percent lower compared to incomes of non-coffee households in their respective area (Table 6).

Table 6: Income portfolios.

	Urban		Rural	
	Non-coffee	Coffee	Non-coffee	Coffee
Income sources (%):				
Agricultural wages	2	3	15	10
Agricultural farming	1	23	13	43
Non-farm salaries	50	24	29	14
Non-farm self-employment	19	16	17	11
Non-labor [a]	27	34	26	22
Total	100	100	100	100
Total annual income per capita (in quetzales)	11,685	10,964	3,733	3,318

[a] This includes returns to capital, private and public transfers as well as pensions.
Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

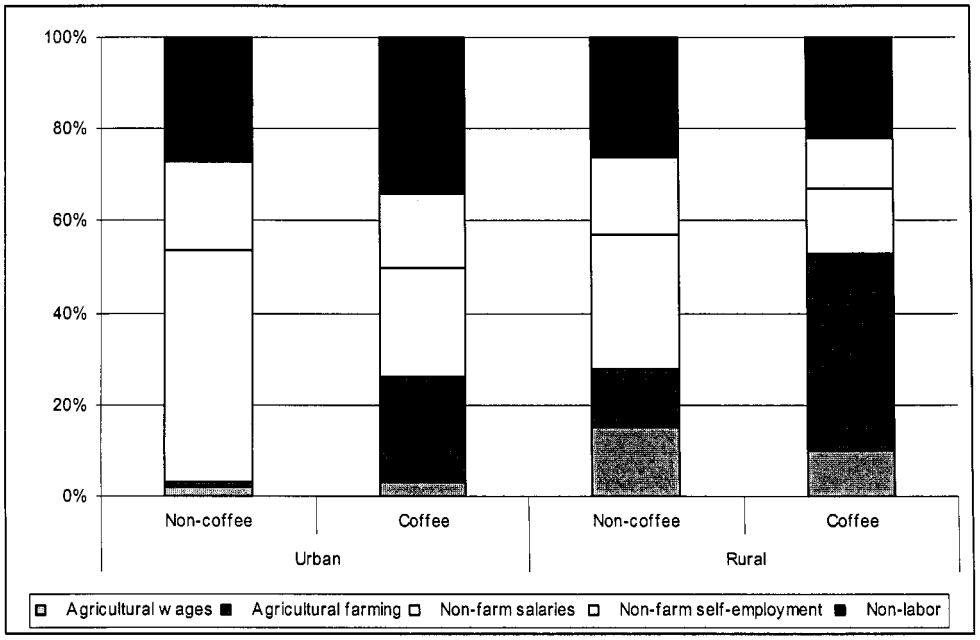
Still, examination of the income portfolios for the various types of households reveals a number of interesting insights. First, rural coffee farm households heavily depend on agricultural incomes. In particular, more than half of the income is derived from agricultural wages or farm activities (Table 6 and Figure 3). In fact, coffee sales among rural coffee farmers comprise more than 23 percent of total income (Table 7).

Table 7: Coffee sales.

	Urban	Rural
Average coffee sales (Quetzales) [a]	15,430	4,525
Share of coffee sales to total household income [a]	23.4	23.3

[a] For coffee producers only. Coffee sales does not refers to net revenues but only coffee receipts (coffee price times quantity sold).
Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

Figure 3: Income portfolios.



Second, urban coffee farmers are less dependent on agricultural income. Only about a quarter of their income is derived from agricultural activities (Table 6). Instead, more than 40 percent of their income comes from non-agricultural salaried employment or self-employment. Still, coffee sales among urban farmers also represent about 23 percent total household income (Table 7).

Finally, non-coffee households in both areas depend significantly more on non-agricultural incomes. As expected, while rural households are diversified in both agricultural and non-agricultural activities, urban non-coffee households derive practically no income form agricultural employment (Table 6).

Insights from the shocks module

As the previous sections suggest, coffee farmers are poorer compared to regional non-coffee counterparts, and are more likely to have significantly lower socio-economic indicators. Understanding the extent by which the observed patterns are due to the coffee crisis shock or other differences is important. While the data is static in nature, the survey did collect information related to various shocks affecting households and available coping mechanisms employed. This information is used here to assess at least partially how the coffee crisis may have affected coffee farmers.

Three shocks that can be related to "coffee" can be distinguished: (i) whether a household member has lost a job; (ii) whether the household has experienced income losses; (iii) whether the price of a product produced by the household has decreased. While none of these are specific to coffee farmers, it is expected that these are the types of shocks that would be associated with exposure to the coffee crisis. As such, comparing the incidence of these types of shocks among coffee farmers as well as non-coffee households is useful.

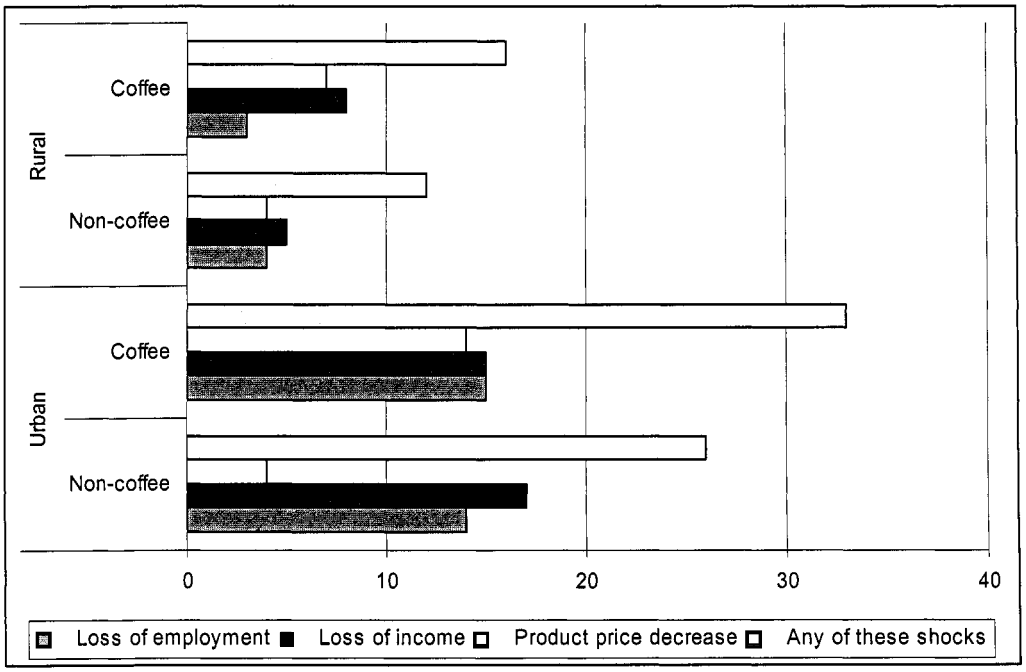
Overall, coffee farmers are significantly more likely to experience any of the three shocks discussed above. In particular, 33 and 16 percent of urban and rural coffee farmers respectively have been affected by one of the shocks (Table 8 and Figure 3). This compares with 26 and 12 percent for the non-coffee counterparts. Still, experiencing product price decreases is by far more widespread among coffee farmers compared to non-coffee households. By contrast, the incidences of loss of income or employment are relatively similar between coffee farmers and non-coffee households. As such, these trends suggest that while shocks are not uncommon among all households in both rural and urban areas, coffee farmers have been affected more from product price decreases compared to non-coffee households, which is expected.

Table 8: Shocks incidences.

	Urban		Rural	
	Non-coffee	Coffee	Non-coffee	Coffee
Household experiencing (%)				
Loss of employment	14	15	4	3
Loss of income	17	15	5	8
Product price decrease	4	14	4	7
Any of the shocks above	26	33	12	16
Among those who suffered any of the shocks above:				
Shock resulted in (%):				
Income loss	93	100	84	91
Asset loss	2	0	1	2
Both income and assets losses	2	0	12	6
No loses	3	0	3	1
Total	100	100	100	100
Main coping mechanisms to address shocks				
Did nothing	24	20	27	29
Increased hours worked	24	19	21	15
Decrease in consumption	22	19	26	33
Used savings	8	17	8	10
Borrowed	5	4	3	3
Sold assets (animals, land, property)	1	0	4	3
Other	15	21	11	7
Total	100	100	100	100
Have the losses being completely recovered (yes=1)	23	9	22	11
When do you anticipate to fully recover from shock:				
Less than 6 months	9	0	9	2
Between 6-12 months	8	2	6	7
More than a year	8	48	8	10
Not sure	75	50	77	81
Total	100	100	100	100

Source: World Bank calculations using ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

Figure 4: Shocks incidences.



The majority of the households affected by these shocks also experienced income and asset declines. For example, among rural coffee farmers affected by any of these shocks, only one percent reported not been affected in terms of income or asset declines (Table 8). Still, experiencing income losses was the most frequent impact on household welfare.

From a policy perspective, exploring what coping mechanisms are employed by affected households is important to understand gaps and potential interventions that can be implemented. In terms of coffee farm households affected by a shock, the main coping mechanisms to mitigate the adverse impact were increased labor supply (15 percent for rural coffee farmers and 19 percent for urban), decreasing household consumption (more than 33 percent for rural coffee farmers) and used own savings (ten percent for rural and 17 percent for urban coffee farmers). Still, 29 percent of rural coffee farmers did nothing to mitigate the shocks, implying that there may be lack of coping instruments (Table 8).

Nonetheless, similar patterns emerge for non-coffee households in terms of available coping mechanisms. For example, about a fifth of non-coffee households affected by a shock worked more and about ten percent used savings. Still, coffee farmers are more likely to decrease consumption compared to non-coffee households. These patterns are not conclusive, but the seem to suggest that while shocks do affect a number of heterogeneous households in both rural and urban areas, coffee farmers may have had fewer coping mechanisms compared to non-coffee households, which could partially explain the lower welfare indicators discussed earlier.

Finally, the shock module also included questions as to whether households had recovered from the adverse effect of the shocks and if not how long would it take to do so. The majority of coffee farmers (90 percent for both urban and rural) had not recovered from shock (Table 8). In addition, while rural coffee farmers are unsure about the time it will take to recover, urban coffee farmers expect it will take more than a year. These patterns suggest a high level of uncertainty about the ability of these households to regain their original welfare levels.

Discussion

This note highlighted the situation for small scale coffee farmers in Guatemala. To the extent that the static nature of the data limits inferences about the potential impact of the coffee crisis on affected households, the analysis from the ENCOVI 2000 indicates that the coffee farmers may have been affected by the coffee crisis households in several dimensions. In particular, coffee farmers seem to have experienced declines in incomes and consumption as well as increases in the incidence of poverty. In addition, coffee farm households were more likely to experience shocks that adversely affected incomes and assets compared to non-coffee households.

In order to cope with the shocks, coffee farmers increased labor supply, decreased consumption and to a lesser extent have used up savings. Such coping strategies may be harmful to the extent that they may imply taking children out of school or deterioration of the nutritional intake of household members, especially for children.

The fact that at least 10 percent of all rural households are involved in coffee production, and since more than 80 percent of the coffee production is concentrated in 3 regions suggests that the overall impacts of the coffee crisis may be even greater, especially if one takes into account the effect of the crisis on households whose income depends on wage employment in the coffee industry. According to ANACAFE, an estimated 200,000 people are permanently employed in the coffee industry. This figure increases to more than 500,000 during the coffee harvest. Most laborers (jornaleros) in the coffee sector are seasonal migrants from poor households that depend on the coffee sector to augment their incomes. While exploring coffee laborers using this data is not possible, an estimated 40,000 jobs related to coffee production were expected to be lost in 2002 (ANACAFE puts this figure at 60,000).[85] As most of these jobs are expected to be low-end jobs, the effect on the poor is likely to be greater.

As such, to further understand the interaction and potential impact of the crisis, panel data will be required in order to adequately assess changes in welfare indicators, examine household responses and strategies to cope with the crisis, explore the impacts on human capital outcomes as well as assess the government's response to the crisis.

[85] Ministry of Agriculture.