Land and labor adjustment strategies during an economic downturn in rural El Salvador

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Land and labor adjustment strategies during an economicdownturn in rural El Salvador[#]

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Abstract

Households differ in their ability to protect the value of productive investments and consumption in the face of unexpected income shocks especially in changing economic environments. Using a two-year panel of 489 rural households in El Salvador first interviewed in 1995 this paper traces the impact of a weather-related downturn in 1997 rural economic activity on household incomes and welfare and examines how the pattern of adjustment strategies was affected by households' initial asset holdings and other characteristics. A decomposition of the changing poverty profile suggests that a loss of wage labor hours was particularly important in explaining the fall in incomes and welfare amongst the poor, and that landless agricultural laborers were especially vulnerable. Panel regressions suggests that households which owned some land may have been better able to protect the marginal return to labor time in the downturn year as compared to households of similar characteristics without land. Households with more education were also able to protect income more effectively. Other coping strategies examined include household access to credit and remittances, asset sales, and/or disinvestment including in children's schooling. While school enrollment rises over time for all groups, on the margin, the decision to keep children enrolled in school during an economic downturn is positively affected by land holdings.

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Introduction

In addition to the usual uncertainty associated with the natural elements and the seasons, rural households in El Salvador have also had to learn how to cope with the disruption and changing opportunities presented by an economy that has over the last few decades has been buffeted by violent political conflict, property rights reforms, the large scale displacement of populations, and more recently by structural adjustment and far reaching liberalization and economic reforms. While most of these tumultuous events are now over, economic relations in the countryside and households' income generating and risk-coping strategies have almost surely been transformed.

The purpose of this paper is to examine how rural households in El Salvador adapted to a weather-related downturn in agricultural economic activity in the mid late nineties. By examining the observed pattern of income shocks and adjustment strategies across a population of rural households we aim to understand which types of households were most poor and vulnerable. The analysis highlights the role of labor supply reallocations between wage and self-employment and farm and non-farm activities and the role of household land ownership and education in affecting the response.

We employ a two-year panel of 489 rural households that were first interviewed in 1995 and then again in 1997. The dataset was collected by the Fundación Salvadoreña para el Desarollo Económico y Social (FUSADES) in collaboration with the World Bank (in 1995) and USAID and The Ohio State University (in 1997) and will be described in more detail below. The year 1995 was comparatively a very good year for small farm producers and agricultural workers as the agricultural labor market was tight and maize and other basic grains production was up. The year 1997 by comparison was bad, as unusual weather events and the continued appreciation of the currency and associated decline in the agricultural terms of trade, conspired to produce a fall in production and labor demand in many crops that fell especially heavily on poorer households.

Although *average* per-capita household income in the entire sample declined by a relatively moderate 1.3 percent in real terms over this short period, the impact across households was in fact very highly differentiated. When households are classified by income quintiles according to

their average per-capita income for the two-year period, the highest income quintile households can be seen to have taken advantage of changing economic opportunities by increasing their real incomes by nearly nine percent. In sharp contrast, the lowest quintile of households faced a crisis-proportion income drop, losing on average a full third of their 1995 income levels.

We use poverty decomposition and panel regression analysis to identify which households were most vulnerable to losing income during this period and how they adjusted to protect human capital investments by reallocating labor to other income generating activities, selling assets, or relying on credit markets, remittances or private and public safety nets. The analysis highlights the role played by education and land ownership in conditioning households' responses to exogenous shocks.

Our findings offer an interesting additional perspective on several earlier studies that have discussed the role of land in rural income generation in El Salvador.[1] We share the finding of several of these studies that landownership does not appear to raise households out of poverty unless farm area exceeds a size threshold considerably larger than what most households in the sample possess, and that non-farm wage employment and some types of non-farm self-employment activities lead to higher incomes. What the panel analysis adds, that cross-section analysis cannot capture, is the great amount of movement in incomes and employment status, and the ways in which land ownership, education and other household characteristics determine how households adjust to these, and hence their vulnerability.

We find that much of the increase in poverty that took place between 1995 and 1997, as captured by three different poverty measures, can be attributed to the loss of agricultural and non-agricultural wage employment. Total aggregate hours worked in wage employment fell by over 20 percent over these two years. Unable to sell as many hours on the agricultural wage market in 1997 as in 1995, households responded by re-allocating household labor toward farm and non-farm self-employment activities. Total household labor supply increased in this transition, mainly due to an expansion in female labor supply. Many households that lost wage opportunities had little choice but to fall back on farm and non-farm self-employment strategies where productivity was generally low and many depended on what other productive assets were

[1] Lopez' (1998), Lanjouw (1997), Larde de Palomo (1999) and Briones (2000)) have all carried out analyses using a single cross-section of the data. Beneke de Sanfeliu (2000) and current research by Claudio Gonzalez-Vega and Sergio Navajas employ the panel data.

already in their possession. While small landowning farming households are on average quite poor, we test the possibility that they may nonetheless be more successful than their landless counterparts at preserving the marginal return to their labor time during downturns. Confirming what many other studies have also found, we also find that higher initial levels of education are associated with a greater ability to adapt and to maintain or increase income levels.

Public safety net programs appear to have played little direct role in protecting household income and appear on the whole to be poorly targeted. Poor households also appear less likely to receive remittances, partly because remittances have already lifted many households into higher income quintiles, but perhaps also because sending a relative abroad involves significant costs. Education spending appears to be one successful area of public policy intervention over the past several years: despite the downturn school enrollments have continued to rise in all income quintiles, as they have throughout the nineties. We find however that on the margin, households that owned some land were significantly more likely to keep their children enrolled in school during the downturn compared to otherwise similar rural households.

Overall the findings suggest that while small land ownership has not raised many households out of poverty, it may act as a buffer in bad years, and appears to have allowed households to protect the value of their human capital investments. By analyzing these mechanisms and by identifying correlates of poverty and vulnerability the study may hopefully contribute to the identification of simple targeting criteria for poverty alleviation and safety nets.

The rest of the paper is organized as follows. The next section provides some background on the economy of El Salvador in recent years and conditions in the rural sector in particular. The next section describes the dataset employed. Later sections examine the pattern of income changes across households and identifies the substantial reallocation of household labor supply that took place in this period. This is followed by a dynamic poverty decomposition analysis that serves as a first step for identifying which groups of households were most poor and vulnerable to the economic downturn in 1997. Panel regression methods are then used to investigate the correlates of poverty and vulnerability further and to identify whether and how household asset position affected the adjustment. A later section examines the differential impact of the downturn on school enrollments, again focusing on the role that land and initial education might play in affecting these outcomes. A final section concludes.

Economic Background

El Salvador is the smallest country in Central America, and with 292 people per square kilometer in 1998, one of the most densely populated countries in the world. Until the late 1970s El Salvador had a primary-export-led economy characterized by concentrated land ownership and repressive labor practices. Macroeconomic and trade policy was also influenced by Industrialization through Import Substitution (ISI) within the Central American Common Market (CACM). An historical neglect of investment in education and human capital, particularly in rural areas, has led El Salvador to have one of the lowest human development indexes (HDI) in Latin America, after Honduras, Guatemala, Nicaragua and Haiti (UNDP(1999)). The geographic dispersion of poverty and vulnerability incidence of households is very uneven.

During the 1979-1992 period El Salvador was convulsed by a violent civil war, at a cost of over seventy thousand human lives, the displacement of a million and a half persons, and several billion dollars of lost production and infrastructure. The war was finally brought to a formal end with the signature of the Peace Accords in 1992 and the former guerrillas were incorporated into the electoral processes of the country. The early 1990s also marks the beginning of stabilization and structural adjustment programs that according to some observers have led to the most far reaching market reforms in Latin America after Chile.

The pattern of land ownership and agricultural production and investment was greatly disrupted and changed during this entire period as a consequence of the uncertainty and dislocation associated with the war, by agrarian reform in the eighties and the land transfers following the 1992 peace accords[2], and by the sharp adjustments in relative prices brought about by trade liberalization and the steady appreciation of the currency. The operation of land and labor markets was greatly affected as well.

Rather than providing a general background of the economy in El Salvador, this section describes several of the main factors that have had an impact on agricultural and rural activities

[2] Both reforms implied a redistribution of approximately 30 percent of agricultural land. For an account of these events see McReynolds et al. (1989), Seligson (1993), Foley, et. al. (1997), and Wood (1995).

during the 1992-1998 period, and especially during the years of 1995 and 1997 which correspond to the survey years used in the empirical section of the paper.[3]

Rebounding from more than a decade of war and destruction, the country experienced a period of very rapid growth between 1992 and 1995, but growth has slowed since. Real GDP growth averaged 6.8 percent from 1992-95, but only 3.0 percent for the 1996-1999 period. The more rapid growth in the first half of the nineties can be attributed to the signature of the Peace Accords in 1992, the recovery of the Central American Common Market, and a consumption boom led by initially optimistic expectations. The slowdown in the second half of the decade has been explained by a conservative monetary policy and high real interest rates which slowed down investment and growth, and by a reduction of aggregate demand especially in consumption and exports.

Changing relative prices and structural changes have worked against the agricultural sector. The share of agricultural GDP in total GDP has continued to fall steadily for the past two decades. In 1991 was 16.5 percent and had fallen to only 12.8 percent in 1999. The two most affected crops have been coffee -- the main primary export crop of the country primarily grown on medium and large estates -- and basic grains such as white maize, sorghum, rice, and red beans – crops traditionally produced by small producers. Coffee's share in GDP fell from 4.4 percent in 1991 to 2.5 percent in 1999, while basic grains' GDP fell from 3.1 percent to 2.6 percent. The year 1995 was a good year for agriculture, with a rate of growth of 4.5 percent, well above the decade average of 1.7 percent, while 1997 was a bad year, with growth of only 0.4 percent. This difference was much more dramatically pronounced for small producers where the corresponding rates of growth for basic grains were 13.9 and -4.4 percent respectively.

The declining profitability of agriculture has also had an effect on agricultural wages. The real minimum wage for agricultural workers fell 2.8 percent between 1993 and 1998, even as national GNP grew. The real minimum wage for harvesting coffee and sugarcane fell 12.1 and 11.0 percent respectively over the same period. Over the 1995 to 1997 period considered in the panel analysis below the real minimum wage fell by 8.6 percent.

[3] For a general overview of the Salvadoran economy in the nineteen nineties see Boyce (1996), Melhado (1997), and Rivera Campos (1999,2000).

One rough indicator of welfare and vulnerability in rural areas in El Salvador is the evolution of the poverty headcount. While the urban poverty rate has fallen, and social indicators have in general improved, rural poverty has remained stubbornly high (Larde de Palomo and Arguello de Morera (1999)). Using official figures, the urban poverty headcount rate fell substantially from 52.9 percent in 1992, to 36.0 percent in 1998, and rural poverty fell from 65.0 percent to 58.6 percent (see Table 2).

Leaving aside debates over the proper choice of poverty line, these official poverty measures appear to underestimate the conventionally defined headcount because they report the fraction of *households* under poverty, rather than count the actual number of *persons* under poverty. Using the same poverty line and National Multipurpose Household Survey (MPHS-1998) that the government used, we counted the number of persons in poverty and estimate a headcount rate of 40.6 percent for urban areas, and 64.0 percent in rural areas in 1998. This would imply that approximately 3.05 million individuals live below the poverty line in a total population of 6.04 million people. A more detailed dynamic poverty decomposition, using data from a panel dataset are presented below.

The Human Development Index (HDI) for different regions in the country offers another measure of welfare and reveals extreme regional disparities in income and access to health and education. For instance, the 1996 adult literacy index in urban areas was 0.875 compared to 0.657 in rural areas; the combined enrollment index in urban areas was 0.728, versus 0.534 in rural areas; the longevity index in urban areas was 0.762 and only 0.650 in rural areas; the income index was 0.528 in urban areas and 0.172 in rural areas; and the overall HDI index was 0.762 in urban areas, compared to 0.650 in rural areas (see Table 3). Considering the country's political division into fourteen *departamentos*, the three *departamentos* with the lowest HDI had a human development level similar to that of Kenya or Pakistan -- 138th in the country rankings-- while the *departamento* of San Salvador placed at a level more similar to Cuba, Perú and Jordan -- around 88th in the rankings. These figures reveal the highly asymmetric development of rural areas compared to urban areas in El Salvador, and how wildly individual opportunities for improving welfare via access to educational and health services varies across the country.

This asymmetric development cannot be neglected, as a large fraction of the population and workforce still lives and labors in the countryside, even as out-migration has been steady. In

1992 the rural population was 52.2 percent of the national total. By 1997 the figure had dropped to 45.4 percent. The economically active population (EAP) was 47.5 percent rural and 53.2 percent urban in 1992, changing to 37.8 and 62.2 percent respectively (see Table 4). Even though the share of agriculture in total GDP have been falling over the entire decade, the sector still provides employment for a large segment of the rural population -- 53.3 percent of employed workers in the rural sector.

The steady decline in the importance of agriculture is due to many factors. Leading explanations include: i) years of disinvestments during the war and neglect after war, ii) adverse terms of trade for agriculture because of the continued appreciation of the currency due to the rise of family remittances income from abroad and the country's macroeconomic policy stance, and trade liberalization; iii) financial liberalization and tight monetary policies which have led to a decline in agriculture's share in total credit and an increase in the cost of financing, and iv) adverse weather conditions in recent years. Each of these elements are examined in some more depth below, with an emphasis on how they have affected household income generating strategies, and ability to respond to economic shocks during this period.

i) Dis-investment and neglect during and after war.

Access to communications, transportation, and energy have remained highly unevenly distributed between rural and urban areas. Despite the fact the during the years of the civil war, battles occurred mostly in rural areas, and hence much infrastructure was destroyed there, economic policy and public investment during the nineteen nineties has continued to favor urban areas. According to a 1998 World Bank study only 12.6 percent of all land with potential for irrigation, or 273 thousand hectares, had access to irrigation. The same study found that in 1996 only 20 percent of the country's 9,977 kilometers of highways and rural roads had asphalt paving. In 1997, only 37.4 percent of rural population had access to electricity compared to urban areas where 98.8 percent of the population had access to that service (Rivera Campos (1999)).

ii) Adverse terms of trade.

Beginning in 1993 the government fixed the exchange rate at about 8.75 colones per dollar, and a considerable real appreciation has occurred since then. By the fourth quarter of 1995 the

real effective exchange rate index (REER) had moved from a 1990 base of 100 to 135.7. By the second quarter of 1999 it had reached 154.3 (see Table 5).

Several factors explain this real appreciation of the exchange rate. High amongst them is the existence of family remittances from abroad that have been increasing at high rates every year over the entire decade, after the international migration of approximately one million Salvadorans to the United States. Family remittances as a share of GDP averaged 11.7 percent between 1992 and 1999. The inflow of foreign currency has generated a Dutch Disease problem for El Salvador.

Adding to this real exchange rate appreciation, is the liberalization of trade through lowered tariffs and the withdrawal of state interventions in the economy. Beginning in September 1989 tariffs were reduced in a first phase from an initial 0-290% range. The schedule of tariff reductions that was finished on July 1999 left zero tariffs for capital and raw material imports, 5 percent tariffs for inputs from the CACM, 10 percent for inputs from outside the region, and a uniform 15 percent for final goods (with a few exemptions, such as vehicles). Average nominal tariffs for agricultural products prior to reform were 39.0 in 1988, falling to 10.7 percent by January 1995 (World Bank (1998,p. 77)). The liberalization process also included the elimination of price and market interventions for more than 200 products, and the introduction of a Value Added Tax (VAT) in 1993. Agricultural products were excluded from the VAT system however and this translates into a lower effective protection rate in the sector, especially for white maize, one of the main crops for small land holders (World Bank (1998,p 99)).

iii) Financial liberalization and Imperfect Credit Markets

Following the privatization of banks, and the liberalization of interest rates and foreign exchange transactions in the early nineteen nineties, the financial sector boomed. Traditional government credit targeting policies were abandoned and credit began to be assigned according to profitability. Given the unfavorable macroeconomic environment, the share of credit to the agricultural sector from commercial banks and *financieras* has fallen rapidly from 21.0 percent of the national total in 1992 to 8.2 percent in 1999. The cost of financing has risen over the decade, specially since 1995 when the central bank adopted an inflation targeting policy. Inflation was controlled rapidly in 1996 as legal reserve requirements were raised from 20 to 35 percent in just 15 weeks, but at the cost of much higher real interest rates.

Access to credit services in rural areas is highly concentrated. A 1998 World Bank study reports that in 1996 scarcely 20 percent of rural households had outstanding debt balances from formal or informal sources (World Bank (1998)). The study attributes this lack of financial development to: "(i) underdeveloped institutional infrastructure; (ii) Government interventions which crowd out private lenders by allowing weak public sector institutions to lend with poor recovery and low interest rates; (iii) debt-forgiveness programs which have created serious credibility problems by promoting strategic defaults; (iv) previous interventions in agricultural marketing that have prevented the development of informal financing sources such as crop purchase credits; and (v) the recent conflict and the resulting insecurity in rural areas, which impeded the development of informal markets... World Bank (1998, p. 16)."

Access to, and the use of formal savings accounts is also very limited. Amongst the panel survey of rural households analyzed below only 88 of 623 surveyed households (14 percent) had a savings account at a bank or a savings cooperative in 1998. Of those who did not have accounts 76 percent (409 households) said that the reason was they "had nothing left to save." It would appears that households prefer to save in the form of productive assets such as land, animals or consumer durables. Preference for saving through the accumulation of productive assets rather than formal savings accounts could be an indication of a high marginal product of capital within the household production unit (suggesting credit constraints), high transaction costs associated with banking, savings accounts that offer very low real returns, and/or a general distrust of banks.[4]

With little access to formal credit and savings markets and little evidence of extensive informal finance networks, rural households have had to find other ways to anticipate and cope with shocks. These include the accumulation and de-accumulation of productive assets, changing patterns of labor markets participation and land use, and migration and remittances.

iv) Natural weather shocks

Weather risk has always been a fact of life in agriculture, but the weather has been particularly damaging and unpredictable in El Salvador in recent years as a consequence of El Niño and hurricane Mitch. In the 1997-1998 agricultural year almost every crop was affected by

the adverse weather conditions associated with "El Niño." Coffee yields fell 10 percent compared to the previous year, sugar cane fell by 9.1 percent, white maize by 24.6 percent, beans by 3.1 percent, and rice by 16.5 percent. These weather events appear in general not to have been anticipated. Small producers were particularly hard hit because the big fall in white maize yields occurred just as the area cultivated to that crop was increased. El Niño also affected hunting and fishing, as GDP of the sector fell 21.9 percent in 1997, mainly due to a fall in fishing, specially shrimps, one of the country's traditional export crops. Fishing activities are mostly executed by artisan fishermen.

Even though in 1997 El Salvador was affected by El Niño, the effects were not spread evenly over the country. According to Angel (1998) the effects of El Niño in Central America are that rain becomes more abundant on the Atlantic coast, and droughts become frequent on the Pacific coast where El Salvador lies. Temperatures are also higher than normal. Historically, El Salvador has been more affected by a drop in rainfall, and a late start of the rainy season. In 1997 these events were more pronounced in the eastern region and in some regions in the west, but the central region of the country had little changes in rainfall. In addition to the late arrival of the rainy season, higher-than-normal temperatures and lower rainfall during the months of July through September, there was an increase in rainfall during the months of November and December, affecting mostly coffee and sugar cane.

The Panel Data

For most of the analysis of this paper we employ a rural panel household survey collected by 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 World Bank (1998). All survey questions refer to the 1995 calendar year, which is roughly coincident with the agricultural cycle. The survey was designed as a stratified random sample aimed to be representative of the rural population at a 10 percent significance level.[5] A total of 730 rural

[4] The next four leading answers were "the bank is too far away" (11%, 59 responses) or "the minimum balance is too high" (4%, 22 responses), "fear of losing the money (4%, 21 responses), and "interest rates are too low" (2%, 12 responses).

[5] The initial stratification was based on findings from the 1992 labor force census. The stratification called for only 192 'land using' households in order to be nationally representative but an additional 110 households in this category were added to permit production analysis.

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.[6] As the panel analysis demonstrates the distinction between farmers and agricultural workers is in practice somewhat arbitrary and blurry because many people classified as farmers also work for agricultural and non-agricultural wages, and many households that did not farm in one year may have brought land into cultivation in another.

A second round of interviews was conducted in 1998 and a third in 2000. The latter two rounds were done with funding from USAID's BASIS (Broadening Access and Strengthening Input Systems) research program and collaboration from The Ohio State University. A total of 626 interviews were conducted in 1998. Of these, 494 households had been interviewed in 1996. Data problems led us to have to drop five of these households leaving us with a matched panel of 489 households for the analysis below.

With a questionnaire modeled on the World Bank's Living Standards Measurement Survey (LSMS) the FUSADES dataset is the most comprehensive rural panel dataset available for El Salvador[7]. Its main limitation is that it does not record household consumption expenditures. It is a widely held view that consumption expenditures are measured with more accuracy and provide a better indicator of household welfare than income Ravallion (1994). However, the lack of consumption data is partly compensated by the fact that the survey is very careful at capturing the many different sources of household income including income from self-employment activities, as well as household asset position and credit transactions.

Beneke de Sanfeliu (2000) and Lopez (1998) offer detailed descriptions of the survey's design and its comparability to other datasets. Based on rough calculations from national level figures of agricultural GDP, Lopez (1998) estimates that income underreporting in the sample could be as high as around 20 percent, and adjusts all household incomes upward accordingly.[8] As Lopez applies this adjustment equally to all households the comparative analysis that follows

[6] One *manzana* of land represents approximately 0.714 hectares or 1.77 acres of land.
[7] The Salvadoran National Directorate of Studies and the Census (DIGESTYC) collects the Encuesta de Hogares y Propositos Multiples (EHPM) using a shorter nationally representative household survey administered to roughly 20,000 households annually. Although this survey is designed as a rotating panel DIGESTYC has not yet made the data available in panel form. See Lanjouw (1997).
[8] As coffee plantations account for a large fraction of agricultural GDP and there are no coffee plantation owners in the sample, this amount probably overestimates the amount of underreporting in the panel.

below would not be affected whether or not we made this adjustment. The correction is mentioned again below only when discussing estimates of poverty.

Which groups are most poor and vulnerable?

Changes in income by quintiles

An advantage of using panel data is that it allows us to follow changes in income and welfare for particular subgroups of the population. Successive cross-section snapshots cannot distinguish between changes of income or welfare within a group or occupational sub-category from movements of households and individuals across groups. The distinction is important for policy purposes, particularly when trying to identify which groups are most vulnerable to particular policies or economic shocks Ravallion (1994).

Table 6 illustrates this point. Households have been arranged into income quintiles, using per-capita income average for each household across the two periods for the classification. The same household is classified as being in the same quintile in each period.[9] Average income gives a better measure of permanent income and avoids bias in calculating income growth within each quintile.[10] The lower half of the table shows that overall average household income fell in real terms by a relatively moderate 1.3 percent from 1995 to 1997. However this aggregate masks the fact that the fall of incomes within the poorest two quintiles was far more pronounced. The lowest quintile lost almost a third of their 1995 income, while the second quintile almost a quarter. The top quintile of households was clearly able to take better advantage of changing opportunities in the Salvadoran economy as their income rose almost nine percent.

Income per-capita fell on average by 2.8 percent reflecting the fact that incomes fell more sharply in poorer households where household sizes tend to be larger. Overall the table suggests

[9] With 489 households in each year there are approximately 98 households per quintile per year. Since poorer families tend to be larger families however there are more individuals in the lowest quintiles. The top panel of the table calculates income-per-capita by averaging across *individuals* in each quintile.

[10] The alternative of classifying households by their income in only one of the two years would yield a misleading impression of income growth by quintile. This is a simple consequence of the fact that some households classified as being in the lower quintiles using 1995 income levels for the classification will be there because of temporary shocks away from permanent income measurement error, and their income is therefore more likely to rise to its permanent level in the next period (the converse is true of those classified in higher quintiles). This explains why using the same data Beneke de Sanfeliu (2000) could report that the lowest deciles experienced very rapid growth while wealthier deciles experienced sharp income declines. Had she classified households by their 1997 income levels she would have found precisely the opposite result.

a very high variance of household incomes. The variance increases in 1997 due to the variability in the weather and labor demand.[11] An unknown amount of this variance may reflect measurement error.

Labor Supply and its Reallocation

Table 7 describes the allocation of household labor time across different income generating categories. The table disaggregates between agricultural and non-agricultural self-employment and wage labor employment categories. Agricultural self-employment activities include working on farm or garden production or tending to animals for self-consumption or the market including time spent to selling those products. Non-farm self-employment activities include hours worked producing crafts, manufactures, repairs or other production or service activities such as running a store. Neither of these categories includes activities such as collecting wood or water, or domestic chores such as food preparation or childcare.

The table indicates the significant mix of activities that are carried out within the typical household in the rural sector of El Salvador. Although the leading outlet for household labor in this panel of households are agricultural self-employment activities, reflecting the significant number of farm household represented in the sample, the second leading outlet is non-farm wage labor employment. In both years households in the sample worked more hours in non-agricultural occupations than in agricultural wage labor, although the distribution between these categories varies greatly across income quintiles. Lower quintile households are much less likely to have non-agricultural wage employment.

A very significant reallocation of labor occurred over the span of just two years. While in 1995 wage labor hours represented 60 percent of household labor supply to income generating activities, by 1997 wage labor hours had fallen nearly twenty percent and represented just 46 percent of supply. Households responded to the loss of wage labor by greatly increasing the hours dedicated to self-employment activities. The extra hours supplied to self-employment activities in fact exceeded the hours withdrawn from wage labor, contributing to a five percent increase in total labor supply, or about 4 hours per week per household.

[11] The standard deviation of income per capita (at an individual level) was 3782 in 1995 and 4364 in 1997. There is evidence of heteroskedasticity as the standard deviation rises approximately linearly with income per capita.

The fall in wage labor hours was significant in both ag- and non-ag categories, but most of the fall -- 57 percent of the drop -- can be attributed to a fall in agricultural labor hours. The fall in wage hours was clearly driven in part by households losing jobs -- there were 13 percent fewer households with wage workers in 1997 compared to 1995 -- as well as by a drop in the average number of hours amongst those that retained wage employment.

Faced by the loss of wage employment, household labor supply to self-employment activities surged 43 percent overall. Although about half of the increase in self-employment (52 percent) can be attributed to an increase in the number of hours dedicated to agricultural self-employment activities, in proportional terms non-agricultural self-employment expanded much faster (by 141 percent). It is significant that there were almost 20 percent more households engaged in self-employment activities in 1997 compared to two years earlier, and the number of households engaged in some form of non-agricultural self-employment activity more than doubled.

A reallocation of labor supply from (tradable) agricultural to (non-tradable) non-agricultural employment is consistent with the continued appreciation of the currency. The shift from wage employment to self-employment may also partly reflect the ongoing fall in the relative price of tradable goods in terms of non-tradables (if wage labor is more common in agriculture and other tradable goods production). The abruptness of the fall in wage hours and the associated fall in incomes leaves little doubt however that the weather and other aggregate shocks led to a fall in aggregate labor demand. The next few sections analyze the impact of these shocks on household income and poverty levels and how different households responded.

A Dynamic Poverty Decomposition analysis

There are many possible ways to define household welfare or socioeconomic status. A poverty index is an aggregative measure that captures both the level and distribution of welfare across households and individuals in a given moment in time. One simple but practical definition of 'vulnerability' is that it refers to changes in welfare or socio-economic status.

The purpose of this section is to provide a profile of rural poverty in El Salvador for the years 1995 and 1997 using three commonly employed measures of poverty. The poverty profile analysis decomposes an aggregate poverty measure in each year into component contributions of different population subgroups. A simple extension of the method will also allow us to

decompose the *changes* in poverty measure from 1995 to 1997 into changes in poverty within sub-groups and population shift effects due to the movement of households from one subgroup to another. The most vulnerable subgroups in the population can then be identified as those households which suffered the largest relative decline in welfare. The analysis brings attention to the great role that changes in occupational status appear to have played in explaining households change in poverty status or welfare.

We focus on the Foster-Greer-Thorbecke (FGT) class of decomposable poverty measures Foster, Greer and Thorbecke (1984) defined as follows. If we order the population according to some measure of household welfare (such as income or consumption per capita) y_i and define a poverty line z or the level of income below which a household is classified as being poor, then the FGT class of poverty measures can be parameterized by a parameter α and defined as:

$$P(\alpha) = \sum_{j=1}^{q} (1 - y_i / z)^{\alpha} / n \text{ comm}$$

Where q is the number of households below the poverty line and n is the population size. When $\alpha = 0$ we get the simple *headcount ratio* $P(0) = \sum_{j=1}^{q} 1/n = q/N$, where q is the number of households below the poverty line z, and N is the total number of households. A better measure of the depth of poverty than the headcount ratio is the *mean proportionate poverty gap* $P(1) = \sum_{j=1}^{q} (1 - y_i/z)/N$. Here the expression z - y_i is the poverty gap which measures a household i's shortfall from the poverty line. The expression $1 - y_i / z$ is the poverty gap measured proportionate to the size of the poverty line z. Compared to the headcount ratio which gives equal weight to all households regardless of their distance below the poverty line, poorer households are given greater weight in the aggregate poverty measure. Finally a better measure of the severity of poverty is the *mean proportionate squared poverty gap* $P(2) = \sum_{j=1}^{q} (1 - y_i/z)^2 / N$, which gives much greater weight to poorer households than those which are closer to the poverty line. In all three welfare measures non-poor households are given zero weight.

A useful property of the FGT class of poverty measures are additive and decomposable. Suppose the overall population of N households can be partitioned into m different population subgroups of sizes N_j, where $j = 1 \ldots m$. Then a poverty measure P can be decomposed $P = \sum_{j=1}^{m} n_j \cdot P_j$ where $P_j = \sum_{i=1}^{n_j} n_j \cdot P_j$ and $n_j = N_j / N$. Thus the aggregate measure P can be written as a weighted average of the poverty measures P_j within each population subgroup where the weights n_j are just that subgroup's share in the total population.

For the poverty comparisons and decompositions below we have used adjustments to the poverty lines used in 1995 and 1997 by the Salvadoran Government. The Salvadoran General directorate of Studies and the Census (DIGESTYC) calculates an indigence line based on the cost of purchasing a basket of goods that will deliver a minimum recommended caloric intake. The poverty line is set at twice this money level and the figure is adjusted each year to take into price changes. The implied per-capita poverty lines, measured in colones of 1997, are 4284 and 4348 for 1995 and 1997 respectively. DIGESTYC reports a rural poverty headcount ratio of 58.2 percent in 1995 and 61.6 percent in 1997. Applying their method to the panel of households in our sample we estimate the poverty headcount at 61 percent and 67 percent respectively.

DIGESTYC's method for calculating poverty appears however to under-represent poverty in El Salvador. For example, their poverty simply counts the number of households that do not reach a household-level poverty line that has been constructed on the assumption that all rural sector households are of the same size in a given year. Since poorer families tend to be larger families (see Table 6), this method undercounts the actual number of people living in poverty. Taking household size into account the poverty estimate from the panel households rises from the figures reported above to a very substantial 73.4 and 74.7 percent for 1995 and 1997 respectively. Even after correcting for household size it appears quite certain that the average household selected into the panel is on average poorer than the one used in DIGESTYC's much larger sample. Income under-reporting could also potentially be larger in the panel.[12]

These concerns are not all that important since we are not so much interested in the exact level of the poverty measure as much of its decomposition in order to understand which groups

were more poor *relative* to other groups or to the same group in a different time period. Under some conditions poverty comparisons across groups or time periods can be sensitive to the choice of poverty line, measurement error, or the poverty measure being compared. However, as Figure 1 shows the 1997 cumulative distribution of real income per-capita lies everywhere above the 1995 distribution, at least up to per-capita-incomes of about 5000 colones which is well above the range of poverty lines considered below. This first order dominance condition indicates that for all possible poverty lines below this threshold would be found to be higher in 1997 than in 1995 by most common poverty measures (Ravallion (1994)). Although not depicted, a second order dominance condition is also met over a wide range around the poverty lines used below, suggesting that the poverty comparisons of measures of the depth of poverty are also robust to the location of the poverty line. Experimenting over a wide range of poverty lines suggested that the poverty decompositions by sub-categories that are presented below are robust to changes in the poverty line -- the qualitative interpretations are not altered.

Figure 1: Cumulative distribution of real income per capita

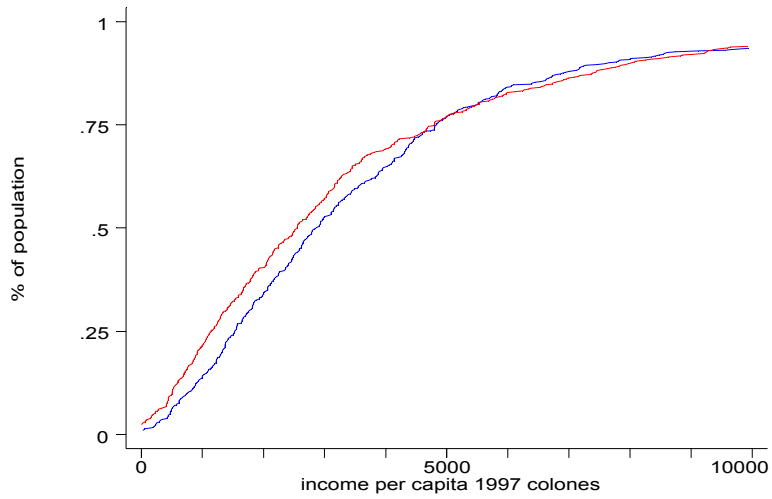

Table 8 presents poverty decompositions by occupational categories for 1995 and 1997 and for the change in poverty between the two periods. Households are classified into one of nine occupational categories depending on whether or not a household member earned income from any of three income sources: agricultural wage labor, non-agricultural wage labor and self-

[12] Average household size in the panel is also larger compared to in the EHPM survey. Since there may be economies in scale in supplying calories to larger households, larger households might require a lower per-capita poverty line, tending to lower the poverty measure.

employment. The self-employment category includes both farm and non-farm self-employment income. Nine households that did not earn from any of these sources were excluded leaving a panel of 480 households. The columns indicated by n_{ti} indicate population shares in these categories in each year, P_{ti} indicates the value of a poverty measure within a subgroup. The 'share' column indicates $(n_{ti}P_{ti})/P_t$, or the share of the aggregate poverty measure in year *t* that is accounted for by the population of category *i*.

The table indicates the largest contribution to the overall incidence, depth, or share of poverty in either year is in households that do not have access to non-agricultural wage employment. The poverty headcount is highest in both years amongst households that depend entirely on agricultural wage employment, but the depth and severity measures are actually worse for households that depend only on self-employment. This suggests the diversity of situations found within the self-employed category.

There are significant changes in household's occupational classification from one year to the other, as indicated by the changing population shares n_{it}. The largest population shift occurs into the self-employment-only category where the population share jumps from slightly over 16 percent in 1995 to 25 percent by 1997. By definition the net increase in this category is due to households having lost or abandoned agricultural or non-agricultural wage employment. Table 9 provides the transition matrix that maps households across categories from year to year.

The right hand panel of Table 8 decomposes the increase in each of the three poverty measures, taking advantage of the following property of additive poverty measures.

$$
\begin{aligned}
P_{97} - P_{95} = & \sum_i (P_{i97} - P_{i95}) n_{i95} \quad \text{(intra-sectoral effects)} \\
& + \sum_i (n_{i97} - n_{i95}) P_{i95} \quad \text{(population shift effects)} \\
& + \sum_i (P_{i97} - P_{i95})(n_{i97} - n_{i95}) \quad \text{(interaction effects)}
\end{aligned}
$$

This formula decomposes the overall *increase* in poverty (P_{97} - P_{95}) into *intra-sectoral effects* (how much changes in poverty within each sector or category would have contributed to the increase had the 1995 population shares remained unchanged), *population shift effects* (how much poverty would have increased due to the observed increases or decreases in population shares had poverty within each group remained at the 1995 levels), and *interaction effects* which

take into account of correlations between population movements and poverty (interaction effects will contribute toward an increase in poverty if households are shifting into sectors were poverty is higher). The table shows contributions as percentages of the overall increase of each poverty measure. A positive number means the effect helped increase poverty, a negative number suggests it worked to lessen it.

Each of the poverty measures appears to point to similar effects, although the relative contributions are obviously different. By far the largest contribution to increases in poverty by any measure can be attributed to the self-employed only category, and in particular, to the arrival of new households into the category. The next highest contribution to the increase in poverty is from the category of households that live by agricultural wage employment and self-employment. Although this group's population share did grow slightly, most of the contribution to the increase is due to an increase in poverty within the sector. The agricultural wage employment only category appears to be contributing to a decrease in overall poverty, but this effect is driven almost entirely by the sizeable exit of households from a category where poverty was high to start. As Table 9 indicates many of these households are ending up in the self-employed only category where they are probably no better off.

A few lessons are evident from inspection of this data. Clearly households employ a variety of livelihood strategies at once and wage employment relationships appear quite transient. The loss of wage employment contributes to explain a very significant part of the increase in poverty of households. Of course other households are finding jobs and hence being lifted further out of poverty.[13]

We also separately ran dynamic poverty decompositions by splitting each of the eight categories described above into two subcategories, depending on whether or not the household *owned* land, yielding a total of sixteen subcategories.[14] This reveals that most of the households in the self-employment-only category in each year were self-employed farmers. The largest part of the influx into the category is also mostly from households that had land in 1995 but lost or gave up a wage job by 1997. Many of these households did not report farming hours in 1995,

[13] For example 88 households who had worked as ag wage laborers had no ag-wage employment by 1997, but 53 households that had not had ag-wage jobs gained this status, for a net loss of 35 households. The net gain of households who took up some self-employment in 1997 was 55. The net loss of non-ag wage households was 8. Note however that many other households reduced their ag- and non-ag-wage hours.

suggesting that they are bringing garden plots or low productivity land into use. The next most important contribution to increasing poverty occurs from the category of households that have no land and combine agricultural activities and self-employment (both farm and non-farm). Although these households retain agricultural wage jobs their hours worked fell and they appear to be responding by moving into self-employment.

The poverty profiles and decomposition analysis are useful for informing us in broad categories about which household groups were most poor or vulnerable but it tells us relatively little about the underlying causes of these conditions. To investigate this issue further we turn to regression analysis that relates a household's income earnings to household characteristics and initial asset position.

By taking advantage of the panel nature of the data we are also able to explore how household characteristics and asset holdings influenced a household's ability to respond to the downturn of 1997. Since household labor is the main asset owned by poor households, and as we have seen, conditions on the Salvadoran labor market were highly volatile in this period it is important to understand how a household's ownership of other complementary factors in the form of human and physical capital affected households' ability to preserve the marginal value product of their labor time. We will test this by observing how the marginal return to household labor changed in 1997 compared to 1995 in household groups with different asset ownership.

The role of education in helping households to adapt to changing economic circumstances and seize new opportunities is an observation often attributed to Theodore Schultz, and many empirical studies have confirmed such an effect. Education will of course also prove to be valuable in explaining household's ability to protect income against a downturn to the extent that opportunities and wages for educated workers are expanding faster than those for uneducated workers. [15]

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[14] Note that some households that do not own land nonetheless farm by renting in land.

[15] Larde de Palomo and Arguello de Morera (1999) used 1997 household information of the same dataset to perform a cross-section analysis which highlights the role of education in explaining a household's level of 'integration' into 'market' activities, and used this in turn to explain household income generation. One key methodological difference between our studies, aside from our panel focus, is that we consider the value of home production of products that could be bought on the market as income. Larde de Palomo's study confirms that education is an important determinant of a household's probability of holding wage employment and/or of producing a marketable surplus.

A Brief digression – a farm household approach

> *'A small peasant and a landless labourer may both be poor,*
> *but their fortunes are not tied together.'*
>
> Amartya Sen in *Poverty and Famines*

A no less obvious, but less frequently explored connection between a household's ownership of productive assets and its ability to reduce income vulnerability is that when faced with a shock that lowers the marginal product of labor sold outside the household (i.e. the market wage) or which makes the household face a ration (e.g. the household cannot find as much work as it would like at the going market wage) households might intensify the use of an existing productive asset such as livestock or a small garden plot, by redirecting labor toward these.

As Amartya Sen has eloquently made clear in his entitlement approach to the analysis of famines, a household's vulnerability is shaped by its command over assets and more broadly by the entitlement or command over resources that these offer. This includes not only physical and human capital but also social and political capital. In his analysis of famines – an extreme case form of vulnerability and entitlement failure – Sen identified landless laborers as a particularly vulnerable group.

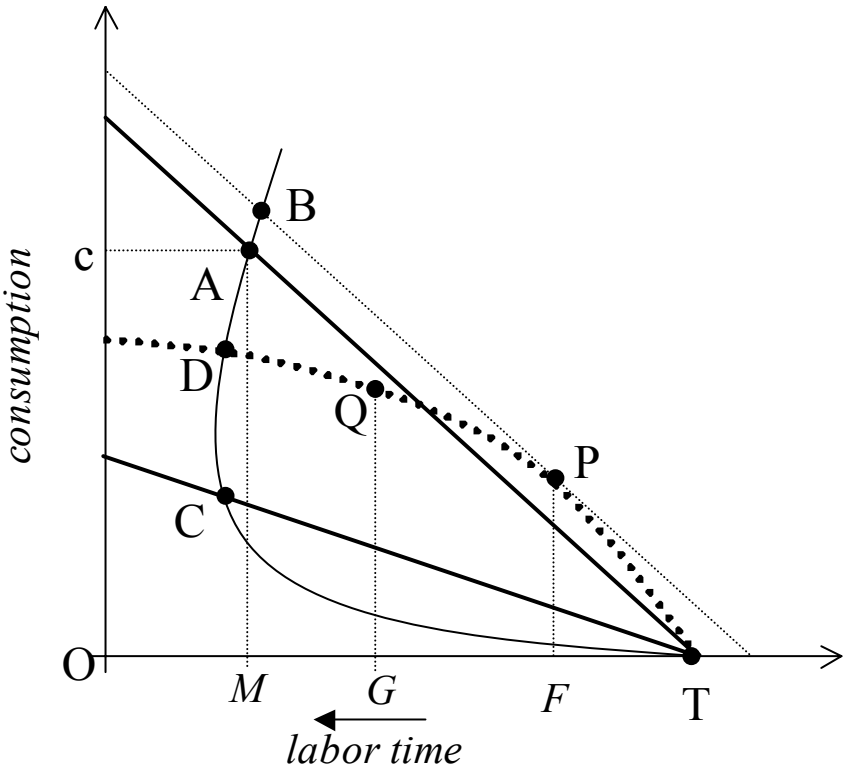
As we have seen, the evidence suggests that climactic and macroeconomic conditions led to a fall in agricultural labor demand in 1997. This affected labor selling households via both a fall in the real wage, (agricultural wages fell relative to the price of agricultural products) and in many households, through a ration on the number of agricultural labor hours they were able to sell to the market.

When households can supply as much labor as they want at the prevailing market wage, the shadow price of labor is just the market wage, and is completely independent of the household's asset position, or whether it chooses to farm or work for a wage. When a household faces a ration on the labor market, in the sense that the household's desired labor supply exceeds the available off-farm wage opportunities plus on-farm labor demand *at the market wage* Benjamin (1992), households are left with little choice but to allocate their excess labor to activities where the shadow price of labor falls beneath the market wage. How much the household is affected may depend in part on the productive assets that households own and are in a position to put into use. For example, a household with land might respond by intensifying the use of family labor

in cultivation beyond the point where the marginal product of labor equals the market wage. This might include bringing previously unused low quality land or garden plots into operation. Landless households may have few options other than enter into very low productivity self-employment activities such as petty crafts, small trading, or begging.[16]

The figure below depicts households' potential adjustment to a fall in agricultural labor demand. Consider first a household that possesses no land and only derives income from wage labor. We normalize the price of the production and consumption good to remain at unity so as to interpret w as the real wage. Household labor supply is found by the familiar condition that the marginal disutility of labor equals to the wage. Labor supply is depicted graphically in the figure below by loci of points TCA along which household indifference curves are tangent to household budget constraints at different wages. At an initial high relative wage the household budget constraint is TA and the household consumes goods and leisure at A. This involves selling MT hours of labor to purchase c consumption goods, and enjoying OM hours of leisure. If the relative wage were to fall so that the budget constraint became TC instead, the new landless household optimum is at C at the new market clearing wage. As drawn household labor supply has increased only slightly but household income in terms of consumption goods has dropped significantly from point *A* to *C*.

[16] On the other hand, landless households may be located closer to towns or markets and may therefore have a larger market for their self-employment activities.



A household with access to land can react differently by bringing this (possibly idle) productive asset into work at new prices. At the initial higher wage the household produced at P and consumed at B. This involved dedicating FT hours to production on the plot and selling slightly less than MF hours to the market. At this market wage household income and consumption are only very slightly higher than that of the landless household. For the same drop in the market wage however this second household is better able to buffer the fall in its income and consumption by reallocating production from P to a point such as Q (where the new wage rate would be set equal to the marginal product of labor on the plot). The key point is that the household with land ends up consuming at a point along the segment AD, at a point above C.

Notice that in this *market clearing* scenario the *marginal* product of labor adjusts to the *same* new level in both landless and landowning households. However the total and *average* product of labor has fallen proportionately more for the landless household. In a regression framework the average effect would be captured by a shift in the intercept term on an income equation, while the marginal effect would be captured by the coefficient on labor supply.

Evidence suggests in fact that many rural households were not able to sell all the agricultural wage labor hours they would have liked to at the market wage in 1997. In terms of the diagram

this means that landless households might have been constrained to consume along the segment TA to the right of point A (under the assumption that the wage remained at the original high level). Households with land facing a similar ration in the labor market would have the additional option of reallocating labor to their own plots[17] to a point along the production frontier beyond *P*. The shadow price of labor on the farm would then be below the market wage, at a value determined by the size of the ration and the size and quality of the household's land holding.

To see this algebraically, let the household land $\overline{T_i}$ be exogenously given at the start of the period, while household labor supply $\overline{L_i}(w)$ is chosen to equate the (shadow) real wage and the marginal rate of substitution between leisure and consumption. With full labor markets income in household *i* is factor income plus any farm profits plus all other income sources captured in B_i.

$$\begin{aligned} Y_i &= F(T_i, L_i) - w(L_i - \overline{L_i}(w)) - v(T_i - \overline{T_i}) + B_i \\ &= \Pi(w, v) + w\overline{L_i}(w) + v\overline{T_i} + B_i \end{aligned}$$

The shadow price of labor $dY_i / d\overline{L_i}$ is simply the market wage *w* under market clearing. Suppose now instead that the household can only sell $\underline{L} < \overline{L}(w)$ hours to the market, and the farm is the only place to allocate surplus labor. Household income can now be written as:

$$Y_i = F(T_i, L_i(w) - \underline{L}) - vT_i + w\underline{L} + v\overline{T_i} + B_i$$

The shadow price of labor can now be expressed as $dY_i / d\overline{L_i} = F_L(T_i, L_i(w) - \underline{L})$. Under the assumption that land is fixed at $\overline{T_i}$ the shadow price of labor now depends on the size of the ration and the household's ownership of land.[18] The shadow (marginal) price of labor for households without access to land in this context would simply be zero, or more realistically, would equal the shadow price of their labor in last-resort self-employment activities.

[17] This is of course not the only place to reallocate labor. Households were also observed to reallocate labor to non-agricultural wage employment and non-agricultural self-employment. But under the assumption that these other opportunities are equally available to landed and landless households of similar characteristics, land ownership (or ownership of any other asset that could be brought into production) would still buffer income.

[18] The inability to adjust at all on the land market does not seem extreme. It seems unlikely that landless households suddenly faced by a ration on the labor market could easily rent in land to equalize the marginal product of labor to the market wage because of credit constraints or the lack of nearby land.

Precisely the same type of story could be told for other productive assets other than land, for example livestock, or vehicles. Other simple predictions follow naturally from this farm household approach. A fall in the wage rate will increase the amount of time spent on home production. An increase in unearned income (for example remittances) should leave it unaffected except for wealth effects.

Working against the effects described above is the possibility that the marginal profitability of farm labor would be adversely affected by unanticipated weather shocks. Since in the aggregate labor demand was clearly affected there appears to be evidence that this was indeed the case. But it seems likely that the marginal product of labor on smaller farms and garden plots producing mostly for self-consumption would be less affected than on medium and large farms that hire in labor. Certainly landholding households would be no worse buffered than an equivalent landless household if weather shocks were *anticipated*.

Econometric Specification

The great diversity of livelihood strategies and occupational choices that the 489 rural households in the sample employ, the frequency with which they appear to move between them, and the apparent mix of price and non-price rationing elements in their economic environment make it difficult to specify and identify a full structural economic model of income vulnerability.

What we do instead is to posit a reduced form model of the determinants of earned income, and then test for some of the implications of the farm household model described above. The reduced form approach can be thought of as a more elaborate description of the correlates and determinants of poverty and vulnerability than the poverty decompositions. Under certain additional identifying assumptions they are suggestive of some of the possible structural model interpretations described in the previous section.

Our formulation is similar to that employed by Glewwe and Hall (1998) in their study of household vulnerability to macroeconomic shocks in Peru. The model specifies (log) income per capita (excluding remittances, subsidies and transfers) as a reduced form function of:

X_{it} = *household-specific and time-variant explanatory variables* such as: female workforce, male workforce, log-household size, number of close relatives living abroad, value of livestock herd, log of land owned per capita, number of kids (<16) in the household.

Z_i = *household-specific and time-invariant explanatory variables*, such as: years of education of the household head in 1995, sex of HH head in 1995, age (and age-squared) of head of HH in 1995, distance to markets, distance to roads.

μ_i = *household specific time-invariant unobserved effects*, such as intrinsic skill or entrepreneurial drive (which can be correlated to some of the X_{it}'s and Z_i's)

ε_{it} = *household-specific, time-variant shocks* (assumed to not be correlated with the X_{it}'s and Z_i's)

Thus, the model can be written as:

$$ln(Y_{i97}) = \alpha_{97} + \beta_{97}X_{i97} + \theta_{97}Z_i + \mu_i + \varepsilon_{i97},$$

$$ln(Y_{i95}) = \alpha_{95} + \beta_{95}X_{i95} + \theta_{95}Z_i + \mu_i + \varepsilon_{i95},$$

A single equation version of the model can be written using dummy variables as:

$$(1) \qquad ln(Y_{it}) = \delta d_t + \alpha_{95} + \eta d_t X_{it} + \beta_{95}X_{it} + \nu d_t Z_i + \theta_{95}Z_i + \mu_i + \varepsilon_{it},$$

where t=95 or 97, d_t is a dummy variable equal to 1 in 1997 and zero otherwise, and $\delta=(\alpha_{97}-\alpha_{95})$, $\eta=(\beta_{97}-\beta_{95})$, and $\nu=(\theta_{97}-\theta_{95})$.

GLS estimation of (1) gives us the random-effects estimators of parameters δ, α_{95}, η, β_{95}, ν, and θ_{95}. These random-effects estimates will be biased if the unobserved effects μ_i are correlated with any of the observed explanatory variables. However, by taking first differences of (1) an alternative fixed-effects estimating equation is obtained:

$$(2) \qquad ln(Y_{i97}/Y_{i95}) = \delta + \eta X_{i97} + \beta_{95}(X_{i97}-X_{i95}) + \nu Z_i + \varepsilon_{it}-\varepsilon_{it-1}.$$

OLS estimation of (2) gets around the problem by sweeping out the household fixed-effects μ_i and gives the *within* estimators of the parameters δ, η, β_{95}, and ν, but not α_{95} and θ_{95}. The parameters of the model can be interpreted as follows: δ is the ceteris paribus percent change in income per-capita between 95 and 97, the intercept α_{95} gives the of log-income per-capita in 95 of a household with zero X_{it} and zero Z_i. Coefficient η measures the change in the effect of the time-variant variable X_{it} between 95 and 97, β_{95} measures the impact of the time-variant variable X_{it} in 1995, and ν measures the *change* in the effect of the time-invariant variable Z_i between 95 and 97. This last coefficient will be of particular interest because it measures the impact of some initial household characteristics on vulnerability. θ_{95} measures the effect of the time-invariant variable Z_i in 95.

Estimation of (1) via GLS and (2) via OLS, give us estimates of both the changes in the return to household endowments (e.g., land and labor), and the effect of household initial conditions on vulnerability. The left panel of Table 11 presents the results of the random-effects estimation. The right panel gives the fixed effects estimates. The second set of columns in each panel reports on regression results after some non-significant variables were excluded.

The results of a Hausman specification test suggest that we cannot reject the null hypothesis that the fixed- and the random effects estimators are the same. We choose the random effects over the fixed-effects since, under consistency of both estimators, the former are more efficient than the latter, and we can also examine estimates of β_{95} and θ_{95}.

The first thing to note is the substantial and statistically significant higher return to the female work force in 1997 compared to 1995 as seen from the coefficient on the interaction (D97 x FW), perhaps indicating that families with more non-working females in 95 were better able to increase their labor supply in 1997 to maintain income per-capita at 95 levels. It could also be explained by the fact that employed women in 1995 were more likely to have already been in self-employment and the tertiary sector, and hence their incomes were less vulnerable than men's to a fall in agricultural wage labor employment and wages Segovia (1997).

The direct measure of the impact of land owned (L – measured as log manzanas) is positive and significant in the random effects but not the fixed effects estimation. However, we find a positive estimated impact of land ownership on returns to labor in 1997 compared to 1995 (D97xDLx(FW+MW)), suggesting that owning land reduced household's vulnerability (the random-effects estimator is positive and significantly different from zero at the 10% level in 1997). The fact that the interaction term was not statistically different from zero in 1995 favors the interpretation that households were rationed in the labor market in 1997 but not in 1995.[19] Thus, despite finding no clear evidence of a statistically significant direct impact of land ownership on per capita income, the data provide strong evidence of the role of land ownership in preserving household's reservation (shadow) wage in bad years.

Both regressions pick up a strong, and statistically significant impact of household's head years of schooling on raising income and reducing vulnerability. That is, the household's head

1995 education level appears to have had a strong positive impact on household income per capita in 1995 before the shock, and an even stronger impact after the shock in 1997, indicating that educated households were better able to adapt to the economic downturn.

There is a positive and statistically significant estimated impact of livestock ownership on income, but no statistically significant change between its impact between 95 and 97, indicating that livestock ownership does not seem to have worked effectively as a risk coping mechanism (perhaps because of the covariate nature of the weather shock and the non-tradability of livestock).

The number of hours supplied by households to both agricultural and non-agricultural wage employment have, as expected a positive impact on income in both 1995 and 1997. In 1995, the impact of non-agricultural hours supplied is significantly higher (in terms of statistical significance at the 5% level) than agricultural hours supplied.[20] The results also suggest that households supplying most of their labor force to agricultural wage employment were harder hit in 1997 than households supplying most of their labor force to non-ag wage employment and self employment activities. This confirms the earlier suspicion that agricultural wage workers suffered the brunt of the weather shock, even more than self cultivating farmers.

Protecting human capital investments -- School enrollments

Several researchers have observed that when markets are incomplete households may respond to unexpected income shocks by reducing the rate of investment in human capital Jacoby and Skoufias (1997). In developing countries, where financial markets are thin or even missing, this impact can be potentially costly both to households and to society. A testable implication of financial market completeness is that investments in human capital should not be responsive to household's current asset position, since investments in education should depend on future expected returns. When markets are incomplete however, a household's ability and

[19] With a market clearing wage, separability obtains and the marginal product of labor is determined by the market wage and should not depend on land asset ownership Singh, Squire and Strauss (1986). Note however that the fixed-effects estimators are positive and significantly different from zero at the 10% level for 1995.

[20] Note that we have already included potential labor hours for men and women. Beside agricultural and non-agricultural employment the household can dedicate labor to self-employment or home activities. We also ran the regressions without including hours and this did not qualitatively change the estimates reported above.

willingness to protect investments in human capital accumulation may depend on its ability to save out of accumulated savings, or its access to credit and safety nets.

An evaluation of the responsiveness of school enrollment rates to exogenous shocks is of interest particularly because the Salvadoran government has made education a high priority area for social investment in recent years. The educational reforms that have been carried out are supposed to improve the targeting of resources to poor areas, and provide incentives for parents to keep children in school. Aggregate pre-school, primary, and secondary education enrollments have risen steadily since the end of the war Sawada and Jimenez (1998).

In this section we examine how household characteristics such as ownership of assets and access to remittances affected the way different households adjusted their rate of human capital accumulation in response to economic events. We examine this by specifying school enrollment rate equations for different school age categories as functions of household characteristics and an unobserved random disturbance. The school age categories considered are: elementary (ages 5-11), primary (ages 12-15), and secondary (ages 16-18). We assume a linear relation between school enrollment and household and environmental characteristics:

$$S_{it} = \beta' X_{it} + \gamma' Z_i + \varepsilon_{it}, \quad (1)$$

where S_{it} is the ratio of enrolled children to the total number of children in the respective school age category (e.g., for the elementary enrollment equation, S_{it} is the household's proportion of children older than 4 and younger than 12 enrolled in elementary school). X_{it} and Z_i are time-variant and invariant household characteristics, and ε_{it} are unobserved disturbances. Because S_{it} is bounded between 0 and 1, we estimate (1) via a two-limit Tobit procedure. Estimation results are presented in Table 12.[21]

The results indicate that all else equal, the 1997 events that affected rural income and employment appear not to have caused a major change in the response of enrollment rates to household characteristics. As we cannot reject the null hypotheses that the coefficients for the variables interacted with the 1997 dummy variables are jointly equal to zero at the conventional

[21] Since for each enrollment equation we only include households with children in the relevant age group, sample selection biases may be a problem given that the presence of children in each age category is likely to be endogenous. However, we expect the biases to be small for the elementary and primary enrollment equations, since fertility decisions were made long before the observed income shocks and the children in these groups are less likely to leave the household because of the shocks. The biases, however, might be stronger in the secondary enrollment

levels of statistical significance, we analyze a more parsimonious specification without interactions.

Nonetheless, the estimated coefficients for the remaining variables do indicate that several household-specific characteristics affect school enrollment. Schooling of the head of the household is the most important determinant of enrollment rates of children in all age groups, particularly for children between 12 and 18 years of age. The smaller effect on younger children suggests that parents of all educational backgrounds consider primary education to be important, and/or that education reform and school-lunch programs are providing incentives for parents to keep their children in school.

Most interestingly land ownership appears as a positive and significant variable affecting enrollment rates in all school age groups. Land ownership has a positive impact on enrollment even when income per-capita is included as explanatory variable[22]. This result may indicate that land ownership is associated with greater supply of education (perhaps because land owning communities are more likely to take the necessary collective action to bring about greater supply of educational services, or because the government is targeting rural areas), or maybe because households that derive income from farm-self employment are better able to shift hours to accommodate study than households that derive income primarily from off-farm employment and wage labor, and hence are less likely to sacrifice investments in human capital accumulation. Although our reduced form framework cannot identify whether land ownership affects enrollment via supply or demand effects, the results nonetheless suggest that a more egalitarian distribution of land may have a significant impact on human capital accumulation.

Not surprisingly, a household's distance from the relevant school has a negative impact on enrollment rates, particularly at the primary and secondary level. This suggests that supply side interventions, such as building rural schools and lowering transport costs to students could have a significant impact on the rates of investment in human capital. Finally, the results also indicate that household size has a negative effect on enrollment.

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equation because at this age (16-18) the young are more likely to respond to income shocks by leaving the household (e.g., because of marriage or migration).

[22] Regression results without income in the right hand side also indicate that land ownership has a positive impact on enrollment rates.

Conclusion

Rural households in developing countries are not only typically more poor compared to their urban counterparts but also tend to manage more volatile income streams. Rural households and their communities have learned to deploy a diversity of risk coping strategies to help smooth consumption and protect the value of productive investments in the face of exogenous shocks. These strategies include tapping into informal credit and insurance markets, inter-temporal asset management and production diversification.

As ingenious as many of these mechanisms have been proven to be, an emerging consensus amongst economists is that the consumption smoothing afforded is far from perfect and that the risk coping strategies are often costly, particularly for asset-poor households.[23] Some economists have argued from this that incomplete credit and insurance markets can create poverty traps, for example by making human capital and other long-term investment plans more vulnerable to disruption by temporary income shocks (Eswaran and Kotwal (1989)). In newly liberalized economic environments asset-poor households may be less likely to be able to take advantage of new but risky opportunities as economic restructuring leads to initially more variable and unpredictable economic environments (Morduch (1993)).

The evidence provided in this paper reveals both the very high variability of rural incomes in El Salvador in the late nineties and correlates of poverty and vulnerability. The significant fall in incomes amongst the poorer families in the sample that occurred in the space of just two years was shown to have been driven in large part by a rather abrupt decline in both agricultural and non-agricultural wage employment. Although the data at our disposal did not permit a direct measurement of how well households were able to buffer consumption against income shocks, we did uncover evidence to suggest that consumption smoothing is incomplete and may involve substantial costs. Households appeared to have little access to formal credit or savings accounts or to public safety nets and hence to have responded to temporary income shocks by increasing labor supply and by falling back on both farm and non-farm self employment activities, and/or by cutting back on planned investments. Each of these may be costly second-best responses to a temporary income shock. We also found evidence to suggest that land ownership was important in household strategies to protect human capital investments and to preserve the marginal return

to labor during downturns even though this landownership was not sufficient to raise households out of poverty.

Several policy conclusions may be suggested from the analysis. Improving household access to secure and low transaction costs financial savings and credit services is also obviously important for providing households with alternative instruments for coping with risk which are less costly than the strategies that households are forced to deploy, for example holding productive assets below or above what their optimal scale would be in the presence of less risk.

The analysis indicates that households with more educated heads were better able to preserve their income levels after the unexpected economic shock. Moreover, households with more educated heads were less likely to remove children from school as a response to the crisis. This suggests that perhaps more educated individuals are less likely to lose wage employment during periods of economic downturn, and, therefore, are not only more able to preserve income levels, but are also better able to maintain their desired level of investment in human capital. Thus, policies to improve access to education may, in the medium and long-term, help mitigate the impact of future economic downturns. For instance, as indicated by our econometric analysis, governments may boost school enrolment rates by simply reducing the distance (or travel time) to schools via the provision of free public school transportation.

It has become fashionable in recent policy discussions to emphasize the important role of non-farm self-employment activities in rural household income generation. Our study amply confirms the importance of this income source, but also suggests the very fluid ways in which households juggle their time between different types of employment activities. Several observers seem to be concerned by the apparent 'limited market insertion' of rural Salvadoran households that have 'retreated' into self-sufficiency in the nineties and following land distributions. Increasing household's 'insertion' into the market by increasing the availability, or productivity, of non-farm self-employment activities and non-farm wage employment are surely welcome measures and will help raise and diversify household incomes. But it sometimes seems to have be forgotten that raising farm productivity on small-farms can just as surely raise incomes on small farms and insert households into the market.

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[23] Recent surveys of the literature include Alderman (1992), Besley (1994), Deaton (1997), Morduch (1995), and Bardhan and Udry (1999).

Both farm and non-farm self-employment activities serve an important role as fall-back activities for many rural households when sometimes more lucrative wage employment fails. The fact that land ownership may protect the marginal return to labor when households fall back on farm self-employment activities during economic downturns suggests the value of widespread access to land, but also may suggest that land and credit markets are not properly working.

Given the significant impact of the loss of wage employment on rural poverty and welfare, and the historical neglect of investments in rural areas, it might seem possible to design and implement infrastructure investment programs that served a useful public purpose and were at the same time labor intensive and also worked as a safety net for vulnerable families. For example temporary public works employment programs could be targeted in bad years to households or geographic communities which depend on agricultural wage employment. A great many countries have had success at implementing such programs in an efficient and decentralized fashion Grosh (1994). By offering less than the minimum agricultural wage programs are self-targeting and typically short-lived. Although we have not done so in this paper it is a straightforward exercise to measure by how much poverty could have been reduced within a given budget with such a program.

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Table 1: Real Agricultural Output 1994-1998

Agricultural Production
Calendar Year

		Algodón			Arroz		Caña	Ganado	Ganado		Avicultura	
	Café	en oro	Maíz	Frijol	en oro	Maicillo	de Azúcar	Vacuno	Porcino	Leche	Carne	Huevos
Año	(Miles de quintales)						(Miles T.C.)	(Miles cabezas)		(Miles litros)	(Miles Libras)	(Miles Unidades)
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 p/	2,847.3	-	11,182.0	1,464.6	933.4	4,340.8	5,121.0	166.0	131.0	356,400.0	125,100.0	1,000,600.0
1998 p/	2,512.0	-	12,152.0	990.6	690.2	3,665.5	5,900.0	166.0	133.0	331,470.0	138,300.0	1,016,000.0

FUENTE: Cifras elaboradas con Información del 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) cifras preliminares.
Cuadro tomado de la Revista Trimestral del Banco Central de Reserva.

Growth in Production Volume.
Calendar Year

		Algodón			Arroz		Caña	Ganado	Ganado		Avicultura	
	Café	en oro	Maíz	Frijol	en oro	Maicillo	de Azúcar	Vacuno	Porcino	Leche	Carne	Huevos
Año	(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 p/	-7%	0%	-17%	14%	19%	10%	24%	2%	2%	12%	7%	3%
1998 p/	-12%	0%	9%	-32%	-26%	-16%	15%	0%	2%	-7%	11%	2%

FUENTE: Cifras elaboradas con Información del 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) cifras preliminares.
Cuadro tomado de la Revista Trimestral del Banco Central de Reserva.

Table 2: Official Poverty Headcount Rates in El Salvador

	Extreme Poverty			Relative Poverty			Total Poverty		
Year	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
1992	27.66	21.87	33.97	31.03	30.99	31.07	58.69	52.86	65.04
1993	27.00	20.83	33.78	30.50	29.62	31.47	57.50	50.45	65.25
1994	23.94	16.33	34.78	28.47	27.51	29.84	52.41	43.84	64.62
1995	18.23	12.44	26.46	29.30	27.58	31.74	47.53	40.02	58.20
1996	21.89	14.54	32.34	29.80	27.90	32.50	51.69	42.44	64.84
1997	19.60	12.50	30.00	28.70	26.50	32.10	48.30	39.00	62.10
1998	18.93	12.94	28.72	25.64	23.07	29.85	44.57	36.01	58.57

NOTE: The poverty line is the cost of a basic food basket for the average household. Extreme Poverty refers to the percentage of households with income below the poverty line. Relative Poverty refers to the percentage of households with income above the poverty line, but below twice the poverty line. Total Poverty is Extreme Poverty plus Relative Poverty.

Table 3: Human Development Index by Department, 1996

Departamento	Life Expectancy (years)	Adult Literacy Rate	Combined Enrollment Rate	Per Capita Income ($PPA)	Longevity Index	Educational Level Index	Income Index	H.D.I.
MEDIUM HUMAN DEVELOPMENT								
San Salvador	70.4	90.1%	72.7%	$4,028.00	0.757	0.843	0.564	0.721
La Libertad	69.1	79.5%	62.9%	$3,193.00	0.735	0.739	0.444	0.639
EL SALVADOR	68.6	78.5%	63.4%	$2,653.00	0.727	0.735	0.367	0.609
Santa Ana	69.9	76.5%	53.5%	$2,285.00	0.748	0.688	0.314	0.583
San Miguel	68.8	73.5%	65.0%	$2,265.00	0.730	0.707	0.311	0.582
Cuscatlán	68.0	79.5%	61.9%	$1,986.00	0.717	0.736	0.271	0.575
Sonsonate	68.8	76.5%	55.7%	$2,171.00	0.730	0.696	0.297	0.574
La Paz	67.1	76.8%	62.0%	$1,895.00	0.702	0.719	0.258	0.559
Ahuachapán	67.1	73.9%	59.4%	$1,951.00	0.702	0.691	0.266	0.553
Usulután	68.5	68.5%	63.8%	$1,819.00	0.725	0.669	0.247	0.547
San Vicente	65.6	70.3%	64.8%	$1,583.00	0.677	0.684	0.213	0.524
Chalatenango	64.8	71.0%	62.2%	$1,361.00	0.663	0.681	0.181	0.508
LOW HUMAN DEVELOPMENT								
La Unión	67.2	59.1%	54.5%	$1,096.00	0.703	0.576	0.143	0.474
Cabañas	64.1	63.2%	52.3%	$1,262.00	0.652	0.596	0.167	0.471
Morazán	64.8	55.4%	56.0%	$1,176.00	0.663	0.556	0.155	0.458

SOURCE: DIGESTYC (1997), "Informe sobre Indices de Desarrollo Humano en El Salvador", Cuadro No. 3

Note: According to the UNDP Human Development Report, areas with High Human Development are those with an HDI index greater than 0.8; those with an HDI between 0.5 and 0.8, fall in the Middle Human Development rank, and if the HDI is less than 0.5, the area is in the Low Human Development rank.

Table 4: El Salvador's Population and Workforce, 1998

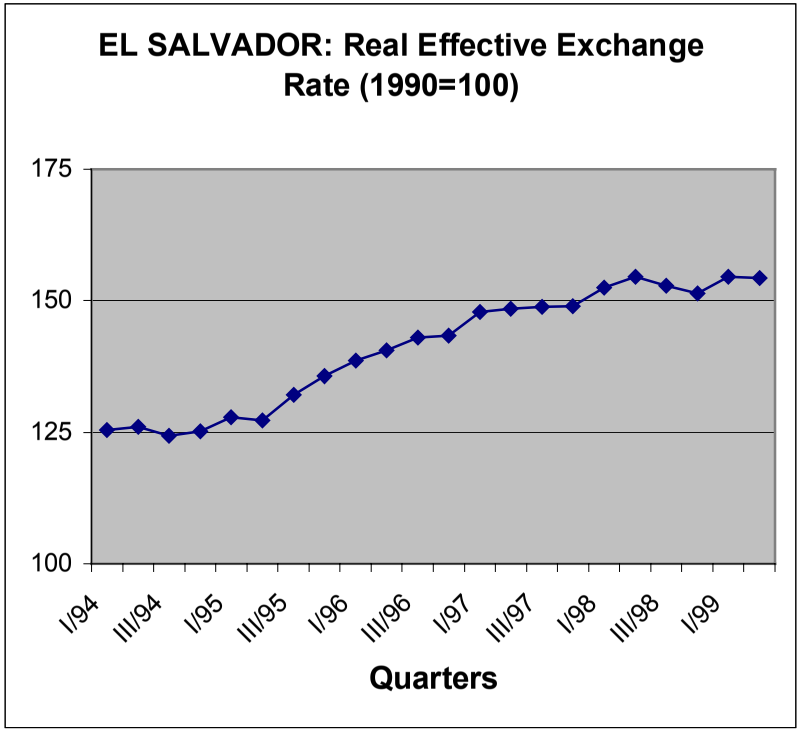
Category	Total	Percent	Urban	Percent	Rural	Percent
Population	6,046,257	100.0%	3,496,700	100.0%	2,549,557	100.0%
Rural-Urban shares	100.0%		57.8%		42.2%	
Male	2,891,875	47.8%	1,636,912	46.8%	1,254,963	49.2%
Female	3,154,382	52.2%	1,859,788	53.2%	1,294,594	50.8%
Working-Age-Population (age>=10)	4,492,837		2,680,952		1,811,885	
Rural-Urban shares	100.0%		59.7%		40.3%	
A. Employed	2,227,471	100.0%	1,380,018	100.0%	847,453	100.0%
Rural-Urban shares	100.0%		62.0%		38.0%	
Rate of Employment	92.7%		92.4%		93.2%	
A.1. Agriculture	539,332	24.2%	88,017	6.4%	451,315	53.3%
A.2. Industry	415,631	18.7%	311,479	22.6%	104,152	12.3%
A.3. Commerce	490,283	22.0%	379,914	27.5%	110,369	13.0%
A.4. Construction	121,185	5.4%	78,707	5.7%	42,478	5.0%
A.5. Public Adm. and Defense	104,746	4.7%	85,178	6.2%	19,568	2.3%
A.6. Hotels and Restaurants	65,574	2.9%	57,513	4.2%	8,061	1.0%
A.7. Transportation and Storage	89,975	4.0%	74,008	5.4%	15,967	1.9%
A.6. Others	400,745	18.0%	305,202	22.1%	95,543	11.3%
B. Unemployed	175,723		113,790		61,933	
Rate of Unemployment	7.3%		7.6%		6.8%	
Economically Active Population (A+B)	2,403,194	53.5%	1,493,808	55.7%	909,386	50.2%
Rural-Urban shares	100.0%		62.2%		37.8%	
Economically Inactive Population	2,089,643	46.5%	1,187,144	44.3%	902,499	49.8%
Rural-Urban shares	100.0%		56.8%		43.2%	

SOURCE: DIGESTYC, Encuesta de Hogares y Propósitos Múltiples, 1998.

Table 5: Real Effective Exchange Rate 1994-1999

(1990 = 100)

Quarter	REER
I/94	125.5
II/94	126.1
III/94	124.3
IV/94	125.2
I/95	127.9
II/95	127.3
III/95	132.1
IV/95	135.7
I/96	138.6
II/96	140.6
III/96	143
IV/96	143.3
I/97	147.8
II/97	148.4
III/97	148.8
IV/97	148.9
I/98	152.5
II/98	154.5
III/98	152.9
IV/98	151.4
I/99	154.6
II/99	154.3



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NOTE: An increase denotes appreciation

Table 6: Household income per-capita by quintiles

	Income per capita		
Quintile	**1995**	**1997**	**%chg**
1	1098	748	-31.9%
2	2070	1708	-17.5%
3	2935	2866	-2.4%
4	4282	4074	-4.9%
5	8591	9332	8.6%
Total	3431	3336	-2.8%
	Household Income		
1	7799	5386	-30.9%
2	13769	11083	-19.5%
3	17790	17954	0.9%
4	23811	23860	0.2%
5	40210	43774	8.9%
Total	20636	20364	-1.3%

Table 7: Hours worked in Wage Labor and Self-Employment

1996	Total Hours	Number Households	Hours per Household
Total Hours	1988836	489	4067
Wage Labor Hours	*1189968*	*408*	*2917*
Agricultural labor	541712	258	2100
Non Ag. labor	648256	235	2759
Self-Employment	*798868*	*302*	*2645*
Agricultural labor	683776	283	2416
Non Agricultural	115092	36	3197
1998			
Total Hours	2092911	489	4280
Wage Labor Hours	*953803*	*357*	*2672*
Agricultural labor	406291	220	1847
Non Ag. labor	547512	211	2595
Self-Employment	*1139108*	*360*	*3164*
Agricultural labor	862275	325	2653
Non Agricultural	276833	76	3643
Change in Hours			
Total Hours	104075	0	213
Wage Labor Hours	*-236165*	*-51*	*-245*
Agricultural labor	-135421	-38	-253
Non Ag. Labor	-100744	-24	-164
Self-Employment	*340240*	*58*	*519*
Agricultural labor	178499	42	237
Non Agricultural	161741	40	446
Percent change			
Total Hours	5%	0%	5%
Wage Labor Hours	*-20%*	*-13%*	*-8%*
Agricultural labor	-25%	-15%	-12%
Non Ag. labor	-16%	-10%	-6%
Self-Employment	*43%*	*19%*	*20%*
Agricultural labor	26%	15%	10%
Non Agricultural	141%	111%	14%

Table 8: Poverty Profiles and decompositions 1995-1997

FGT(0) HEADCOUNT RATIO	**1995**			**1997**			Contribution toward change in poverty:			
	n95i	*P95i*	share	*n97i*	*P97i*	share	Total	Sectoral	Popn. Shift	interaction
001. Self-employed only	0.153	0.684	0.162	0.231	0.745	0.250	160%	22.0%	127.1%	11.2%
010. Non-ag wage only	0.135	0.463	0.097	0.096	0.552	0.077	-23%	28.5%	-43.2%	-8.3%
011. Non-ag wage + Self	0.166	0.489	0.125	0.186	0.482	0.130	21%	-2.6%	24.0%	-0.3%
100. Ag wage only	0.132	0.866	0.176	0.084	0.900	0.110	-91%	10.9%	-97.7%	-3.9%
101. Ag wage + Self	0.218	0.840	0.284	0.229	0.892	0.296	49%	27.0%	21.0%	1.3%
110. Ag wage + non-ag wage	0.100	0.410	0.064	0.064	0.563	0.053	-12%	36.3%	-35.1%	-13.0%
111. Ag & non-ag wage + Self	0.096	0.618	0.092	0.110	0.523	0.083	-5%	-21.8%	19.6%	-3.0%
Total	1.000	**0.646**	1.000	1.000	**0.688**	1.000	100.0%	100.3%	15.7%	-16.1%

FGT(1) POVERTY GAP	**1995**			**1997**			Contribution toward change in poverty:			
	n95i	*P95i*	share	*n97i*	*P97i*	share	Total	Sectoral	Popn. Shift	interaction
001. Self-employed only	0.153	0.436	0.206	0.231	0.518	0.309	82%	19.5%	52.9%	10.0%
010. Non-ag wage only	0.135	0.171	0.071	0.096	0.251	0.062	1%	16.7%	-10.4%	-4.8%
011. Non-ag wage + Self	0.166	0.223	0.114	0.186	0.244	0.117	13%	5.5%	7.1%	0.7%
100. Ag wage only	0.132	0.406	0.165	0.084	0.400	0.087	-31%	-1.1%	-29.9%	0.4%
101. Ag wage + Self	0.218	0.485	0.327	0.229	0.569	0.335	38%	28.3%	7.9%	1.4%
110. Ag wage + non-ag wage	0.100	0.146	0.045	0.064	0.201	0.033	-3%	8.6%	-8.2%	-3.1%
111. Ag & non-ag wage + Self	0.096	0.240	0.071	0.110	0.202	0.057	-2%	-5.7%	5.0%	-0.8%
Total	1.000	**0.324**	1.000	1.000	**0.388**	1.000	100.0%	71.8%	24.4%	3.7%

Table 8 (continued): Poverty Profiles and decompositions 1995-1997

FGT(2) POVERTY GAP SQ	1995			1997			Contribution toward change in poverty:			
	n95i	*P95i*	share	*n97i*	*P97i*	share	Total	Sectoral	Popn. Shift	interaction
001. Self-employed only	0.153	0.345	0.282	0.231	0.484	0.391	77%	27.6%	34.8%	14.1%
010. Non-ag wage only	0.135	0.089	0.051	0.096	0.145	0.048	2%	9.7%	-4.5%	-2.8%
011. Non-ag wage + Self	0.166	0.135	0.099	0.186	0.163	0.106	10%	5.9%	3.6%	0.7%
100. Ag wage only	0.132	0.225	0.170	0.084	0.233	0.068	-13%	1.4%	-13.8%	-0.5%
101. Ag wage + Self	0.218	0.339	0.339	0.229	0.409	0.327	25%	19.8%	4.6%	1.0%
110. Ag wage + non-ag wage	0.100	0.061	0.021	0.064	0.093	0.021	0%	4.1%	-2.8%	-1.5%
111. Ag & non-ag wage + Self	0.096	0.127	0.039	0.110	0.101	0.039	-1%	-3.2%	2.2%	-0.4%
Total	1.000	**0.209**	1.000	1.000	**0.286**	1.000	100.0%	65.4%	24.1%	10.5%

Notes: Poverty lines used were 3427 and 3478 colones per-capita in 1995 and 1997 respectively, both expressed in 1997 colones.

Table 9: Movement across occupational status

Movement across ocupational categories

	1997 Category							
	1	**10**	**11**	**100**	**101**	**110**	**111**	
1	52	1	9	2	10	1	4	79
10	3	26	27	2	6	4	1	69
11	18	9	27	0	13	4	6	77
100	9	4	7	17	27	4	5	73
101	28	1	6	13	37	6	8	99
110	3	5	6	8	4	8	9	43
111	9	2	8	1	6	2	12	40
Total	122	48	90	43	103	29	45	480

Table 10: Household's self-declared emergency coping mechanisms, 1997

Which of the following could you use to handle possible emergencies:		
Read options	Number responses	Percent of HH responding
Stored cash	115	18.5%
A savings account at a bank	83	13.3%
Savings in a cooperative	6	1.0%
Animals can sell	152	24.4%
Grain stored	90	14.5%
Credit card	0	0.0%
Options that were not read		
Would sell land or house	10	1.6%
Would sell something else	4	0.6%
Has other cashflows	4	0.6%
Would seek help from relatives	31	5.0%
Would Borrow	146	23.5%
Has nothing	100	16.1%

Notes: 622 households were interviewed. Households Could give more than one answer.

Table 11: Earnings equation (log per-capita income)

(Dependent variable=log per-capita income)

	RANDOM-EFFECTS				FIXED-EFFECTS			
EXPLANATORY VARIABLES	*Coeffic.*	*t-ratio*	*Coeffic.*	*t-ratio*	*Coeffic.*	*t-ratio*	*Coeffic.*	*t-ratio*
1995 Parameter Estimates								
Intercept	8.6206	18.68	8.5234	19.46	8.3187	17.07	8.2339	18.22
Log-Household size (N)	-0.5691	-2.13	-0.4558	-2.39	-0.1449	-0.35	-0.1296	-0.37
Female workforce (FW)	-0.0621	-0.88	-0.0809	-1.30	-0.1377	-1.29	-0.1301	-1.33
Male Workforce (MW)	0.0353	0.54	0.0492	0.85	-0.0394	-0.39	0.0332	0.35
Land owner dummy (DL)	-0.0072	-0.06	-0.3685	-3.89	0.3439	0.58	0.0401	0.07
Log-manzanas Owned (L)	0.1624	1.97	0.0980	1.66	0.1726	0.57	0.0771	0.28
L-squared	0.0231	1.31	0.0310	2.36	-0.0411	-0.72	-0.0243	-0.45
DL x (FW+MW)	0.0161	-0.84	0.0100	0.67	0.0824	2.30	0.0631	1.91
Number of childrem <16 (K)	-0.0809	-1.65	-0.0920	-2.68	-0.0933	-1.24	-0.0865	-1.39
Value of livestock owned (VL)	0.0020	4.39	0.0019	5.57	0.0021	3.36	0.0018	3.29
Close relatives living abroad (Mig)	-0.0582	-1.18	-0.0242	-0.73	-0.0827	-1.19	-0.0455	-0.88
HH's head years of schooling (ED)	0.0537	3.43	0.0546	3.47				
HH's head aged in 1995 (Age95)	-0.0141	-0.84	-0.0119	-0.70				
Age95-squared	0.0001	0.83	0.0001	0.85				
Female headed HH dummy (DF)	-0.0452	-0.28	-0.0686	-0.43				
Hours in ag-employment in 1995 (Hag)	0.0002	5.46	0.0001	4.63				
Hrs in nonag-employment in 1995 (Hnoag)	0.0003	10.01	0.0002	9.25				
Kilometers to closest market in (d-Mkt)	0.0019	0.38	0.0014	0.27				
Kilometers to paved road market in (d-R)	-0.0060	-0.93	-0.0044	-0.69				
1997-1995 Parameter Shift Estimates								
1997 dummy (D97)	-0.8845	-1.43	-0.6632	-1.24	-0.8045	-1.24	-0.8413	-1.55
D97 x N	0.2570	0.72			0.0166	0.04		
D97 x FW	0.2104	2.31	0.2600	3.92	0.1946	1.85	0.1971	2.64
D97 x MW	0.0460	0.52	0.0524	0.82	0.0749	0.74	0.0291	0.41
D97 x DL	-0.7304	-4.28			-0.6991	-3.74		
D97 x L	-0.1274	-1.18			-0.1280	-1.07		
D97 x L-squared	0.0089	0.38			0.0146	0.57		
D97 x DL x (FW+MW)	0.0254	1.23	0.0209	1.92	0.0313	1.59	0.0201	1.78
D97 x K	-0.0281	-0.44			0.0075	0.10		
D97 x VL	0.0001	0.16			-0.0001	-0.08		
D97 x Mig	0.0619	0.96			0.0593	0.76		
D97 x ED	0.0451	2.20	0.0423	2.04	0.0419	2.03	0.0396	1.90
D97 x Age95	0.0092	0.42	0.0027	0.12	0.0155	0.69	0.0131	0.59
D97 x Age95-squared	0.0000	0.06	0.0000	0.14	0.0000	-0.14	-0.0001	-0.25
D97 x DF	-0.1838	-0.87	-0.1242	-0.59	-0.1698	-0.79	-0.1147	-0.53
D97 x Hag	-0.0002	-4.16	-0.0001	-2.97	-0.0002	-3.81	-0.0001	-2.60
D97 x Hnag	-0.0002	-4.73	-0.0001	-3.60	-0.0001	-4.12	-0.0001	-2.90
D97 x d-Makt	-0.0003	-0.05	0.0003	0.05	-0.0027	-0.40	-0.0020	-0.30
D97 x d-R	0.0042	0.50	0.0010	0.12	0.0067	0.78	0.0036	0.41
sigma_u	0.3527		0.3344		0.9882		0.9579	
sigma_e	0.8670		0.8809		0.8670		0.8809	
rho	0.1420		0.1260		0.5651		0.5418	
Overall R-square			0.3430				0.0440	
Number of observations		934				934		
Number of households		467				467		
Hausman specification test			7.00					

Table 12: Tobit estimation of enrollment equations

	AGE GROUPS											
	16 to 18 years				12 to 15 years				5 to 11 years			
EXPLANATORY VARIABLES	***Coeffic.***	***t-ratio***	***Coeffic.***	***t-ratio***	***Coeffic.***	***t-ratio***	***Coeffic.***	***t-ratio***	***Coeffic.***	***t-ratio***	***Coeffic.***	***t-ratio***
1997 dummy (D97)	0.138	1.96	0.174	0.29	-0.579	-0.13	0.452	1.10	-0.310	-0.22	-0.945	-0.73
HH's head years of schooling (ED)	0.497	2.99	0.489	3.58	0.483	3.50	0.397	3.95	0.044	1.33	0.060	2.39
D97 x ED	-0.025	-0.12			-0.173	-1.02			0.044	0.86		
Female headed HH dummy (DF)	0.562	0.39	0.638	0.61	-0.015	-0.01	0.301	0.39	0.152	0.41	-0.051	-0.20
D97 x DF	-0.085	-0.04			0.806	0.53			-0.412	-0.81		
Land owner dummy (DL)	2.502	2.22	3.368	3.57	0.710	0.99	0.927	1.72	0.772	3.07	0.662	3.64
D97 x DL	1.857	1.21			0.514	0.49			-0.252	-0.71		
Log-manzanas Owned (L)	0.246	0.73	0.558	2.08	-0.179	-0.73	0.128	0.70	0.032	0.34	0.038	0.58
D97 x L	0.587	1.16			0.703	1.85			0.004	0.03		
Close relatives living abroad (Mig)	0.493	1.09	-0.007	-0.02	-0.056	-0.17	-0.145	-0.67	0.042	0.38	0.082	0.95
D97 x Mig	-0.829	-1.20			-0.206	-0.46			0.120	0.68		
Female workforce (FW)	1.484	2.94	0.897	2.46	0.398	1.17	0.302	1.25	0.061	0.53	0.085	0.91
D97 x FW	-0.990	-1.74			-0.278	-0.67			0.064	0.45		
Male Workforce (MW)	0.297	0.73	0.307	0.96	-0.032	-0.11	0.024	0.11	0.172	1.48	0.095	1.09
D97 x MW	-0.241	-0.46			0.063	0.16			-0.143	-1.03		
HH's head aged in 1995 (Age95)	0.088	2.31	0.029	1.07	0.018	0.72	0.024	1.18	-0.002	-0.24	0.000	0.04
D97 x Age95	-0.122	-2.16			0.027	0.64			0.003	0.28		
Distance to primary or secundary school (DS)	-0.092	-1.21	-0.084	-1.54	-0.379	-1.72	-0.473	-2.91	-0.015	-0.21	-0.015	-0.32
D97 x DS	0.001	0.01			-0.169	-0.57			-0.005	-0.05		
Log-income per capita (Y)	0.288	0.53	-0.117	-0.28	-0.131	-0.32	-0.074	-0.25	0.222	1.73	0.190	1.53
D97 x Y	-0.615	-0.80			0.136	0.24			0.081	0.44		
HH members in school age group	0.049	0.08	-0.213	-0.34	-0.239	-0.70	-0.243	-0.70	0.021	0.24	0.020	0.22
Household size (N)	-0.284	-1.91	-0.314	-2.07	-0.178	-1.55	-0.196	-1.69	-0.106	-2.05	-0.103	-2.00
Intercept	-0.114	-2.16	-3.550	-0.95	2.190	0.64	2.162	0.85	-0.537	-0.53	-0.314	-0.32
sigma	4.4201		4.55179		3.24343		3.28619		1.28168		1.28644	
Number of observations	394		394		437		437		576		576	
Log likelihood	-315		-322		-343		-346		-507		-508	