Consumption Smoothing in Less Developed Countries: A Puzzle

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Abstract. This paper presents evidence of household consumption responses to income fluctuations and shocks by exploiting new panel datasets from Nicaragua and Colombia. We find a low, but statistically significant response of consumption to income changes. This respond is asymmetrical to the sign of the change in income. Both Colombia and Nicaragua shows (low) consumption responses to labor shocks and, in the case of Colombia, responses to health shocks. This low level response to income and shocks are puzzling, given the hypothesis of several market failures and incomplete markets in less developed countries.

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1. Introduction

This paper presents evidence of household consumption responses to income fluctuations and shocks by exploiting new panel datasets from Nicaragua and Colombia. Although consumption smoothing has been studied extensively, most of the available studies use data from Asia (for instance, Townsend, 1995; Morduch, 1995; and Kochar, 1998) or the United States (Zeldes, 1989; Cochrane, 1991; and Shea, 1995), only a few studies have investigated consumption smoothing in Latin America (Gracia-Verdu, 2002; and Skoufias, 2002, both of them for the case of México).

Poverty partially stems from households' inability to avoid the conversion of transitory income fluctuations into consumption fluctuations. Income fluctuations create and reinforce poverty through different channels. First, poor households may employ costly informal mechanisms such as moneylenders and pawnshops to cope with income drops. Second, some households may have in-kind precautionary savings vulnerable to price changes (Besley, 1995). Third, households may be forced to deplete their productive assets in order to protect consumption when their income decreases. Finally, when households are unable to protect themselves against income fluctuations they may decide to pursue economic activities with not only low variation in returns but also a low return (Rosenzweig and Binswanger, 1993; Morduch, 1995 and 1999).

Household's income fluctuations can be significant, and they may respond to either macroeconomic or microeconomic events. Macroeconomic events, such as economic recessions, have demonstrated the importance of distinguishing poverty related to the lack of infrastructure and capital investments (including assets and human capital) from poverty caused by changes in current income and consumption. A country can improve accessibility to services but a household's probability to become or remain poor can still largely depend on income and consumption fluctuations (see for instance Rodrik, 1999 and Inter-American Development Bank, IDB, 1997). Such is the case for Latin America. Despite remarkable advances in the provision of public services for poor households during the last two decades, the recession of 1998-1999 induced increases in poverty and deterioration in the income distribution of the region (see IDB, 1998, 1999; and for the specific case of Colombia, World Bank, 2002).

Income fluctuations at household level can also be explained by idiosyncratic shocks. These are shocks that do not co-vary across households and thus households can potentially be insured against their negative impacts on consumption. Contrary to widespread belief, some evidence suggests that these micro shocks explain a large part of

income volatility. For instance, with data from India, Morduch (1991, cited in Morduch 1999) estimates that 75-96 percent of the variance in the logarithm of households' income remains after removing variation due to changes in average-village income and average-household income over the study period. Morduch concludes that "some of this idiosyncratic, residual variation is surely measurement error, but even if half of it is error, substantial idiosyncratic variation still remains" (p. 193).

Although income volatility at the household level is significant in developing countries, in general there are no formal instruments available to cope with the fluctuations. In principle, in well functioning markets the household's portfolio to deal with income fluctuations includes formal financial services and welfare systems. Households may access banking services like credit or insurance. Also, they may also self-insure by means of savings or employ *self-protection*. While market insurance and self-insurance reallocate resources from a good state to a bad state, self-protection lowers the probability of a bad outcome (Gill and Ilahi, 2000; Ehrlich and Becker, 1972).

In practice, most households in developing countries have limited access to capital markets and welfare systems, if such systems exist at all. Interestingly, our empirical results from two developing countries like Colombia and Nicaragua show that households avoid income fluctuations translating into consumption fluctuations. These findings, which are in line with findings in Mexico by Garcia-Verdu (2002) and Skoufias (2002), are a puzzle. How do households avoid fluctuation in consumption in countries with incomplete markets and market failures? Literature on informal insurance provides some clues for such a paradox. Households employ a rich set of institutions and mechanisms to avoid consumption fluctuations that include transfers from family members, rotating savings and moneylenders (see for instance Besley, 1995), increasing labor supply (Kochar, 1998), and taking children out from school (Gaviria, 2001). Households may also postpone health insurance payments to increase short-term liquidity. As noted by Cochrane (1991), households' ability to smooth consumption over states of nature has been controversial since evidence shows that capital markets are far from complete. The key source of conflict, according to Cochrane, is that informal institutions, welfare systems and charities are not taken into account by many as available tools to protect consumption.

The study of consumption smoothing illustrates the relationship between risk and poverty. In this paper we present some empirical evidence by estimating the net effect of the interaction between economic risk, as measured by several different shocks, and protection. That is, we do not estimate income volatility or the specific contribution of certain risk sharing mechanisms on reducing that volatility but we estimate the impact of the whole risk-sharing portfolio of a household on consumption fluctuations. We test for differences in responses across different "groups" of individuals given that different groups vary in their access to consumption smoothing mechanisms or they have different liquidity constraints.

In the next section we discuss the literature on consumption smoothing. Section three presents the empirical strategy of the paper and the construction of the data. Section four presents the results and section five concludes.

2. Theory and empirical evidence of consumption smoothing

The permanent income hypothesis (PIH) of consumption provides an analytical framework to explore the relationship between income and consumption fluctuations. In essence, the PIH predicts that long-term permanent income determines a household's consumption and thus consumption should only respond to permanent shocks in income, and it should remain stable with transitory shocks, either positive or negative. That is, individuals should smooth consumption when faced with temporary income fluctuations (see the classic book of Friedman, 1957).

Subsequent developments of this theory have been undertaken, especially during the last two decades. Hall (1978) empirically tests for the presence of consumption smoothing. He estimates the degree of smoothing by estimating households' responses to fluctuations based on the following equation:

$$u'(c_t) = E_t[\beta(1+r_t)u'(c_{t+1})] \qquad (1)$$

where $u(\,)$ is a concave utility function, c_t and c_{t+1} are consumption at time t and $t+1$, and β and $(1+r_t)$ are the individual discount coefficient and the market interest rate, respectively. The intuition behind the equation is straightforward. Risk-averse individuals prefer a stable consumption through time such that the marginal utility between periods is equal. This implies that individuals will save in times of higher than average income, and will borrow or take savings when income is lower such that consumption remains constant. He finds that only current consumption can explain future consumption, and that real disposable income does not add any value in predicting future consumption.

Mace (1991) also uses Equation 1 to test consumption insurance using a panel data from the US Consumer Expenditure Survey. She cannot reject the full insurance hypothesis. However, in some specifications of the model she rejects full insurance, but even in these her estimates are close to the prediction of the model. The responses of changes in consumption to changes in income range from 0 to 0.03.

The general model (Equation 1) assumes that capital markets and other institutions are efficient and complete. However, when there is a market failure, and a market does not function, this behavior does not hold since saving and borrowing may be restricted. Zeldes (1989) provides evidence with microeconomic data that differences in access to capital markets induce different responses to income fluctuations. That is, high-income individuals with access to the capital market and assets smooth their consumption whereas low-income individuals without the access and liquid assets cannot smooth their consumption.

Shea (1995) advances the empirical literature by including a variable that capture predictable income. He uses microeconomic data of individuals with long-term contracts (individuals in labor unions), and therefore, he is able to construct a measurement of predictable changes on income. He finds, against the theoretical prediction of Equation 1, an strong correlation between changes in consumption and changes in predictable wages.

In the context of developing countries there are also several studies that test for consumption insurance. Townsend (1994) uses the ICRISAT panel dataset for rural India and regresses increases in food consumption against idiosyncratic income growth. He finds a remarkable amount of risk sharing. Townsend (1995) also tests consumption insurance in Thailand using county (not household) level data. He finds that the coefficient of consumption growth to idiosyncratic changes in income is in the neighborhood of 0.3, and the proxies for aggregate, region- or village-level shocks give an coefficient close to 1, as predicted by the full insurance hypothesis.

In the case of Latin America, García-Verdu (2002) performs the test for rural Mexico using data collected for the evaluation of *Progresa*, a conditional cash transfer program funded by the government. He finds a coefficient of respond of the change on consumption to the change in income of 0.48, rejecting the hypothesis of full insurance.

In another strand of the literature, instead of testing changes in consumption due to changes in income, some authors test consumption responses to different kinds of shocks (for instance, Mace, 1991; Cochrane, 1991). Here the underlying assumption is that changes in consumption are independent of idiosyncratic variations in income when risk sharing is perfect, i.e. if individuals manage to cope by using different instruments such as saving or credit. Consumption should, however, respond one to one to aggregate variations in income. For instance, Mace (1991) points out that consumption insurance test can be seen as an extreme case of the permanent income hypothesis since the test investigates if risk-sharing arrangements insure fully against both permanent and transitory idiosyncratic shocks.

Cochrane (1991) uses possible income shocks such as health status and involuntary unemployment of household members as explanatory variables. Using data from the US Panel Study of Income Dynamics (PSID) he finds that full insurance is not rejected for certain moderate-income shocks such as an illness of less than 100 days. Consumption is, however, negatively impacted by a sick leave of more than 100 days (with a coefficient of response of -14.22 and -11.27) and by involuntary unemployment (with a respond of -24.03 and -26.74.)

In summary, based on the above discussion and other results for both developed and developing countries: (i) consumption smoothing is imperfect; and (ii) changes in household consumption largely follow aggregate shocks (usually measured by the average consumption of the village or region).

3. Empirical strategy

a. Empirical strategy

We estimate two main equations. The first equation regresses consumption growth rate against idiosyncratic income growth rate and the second equation regresses consumption growth rate against different negative shocks.

Two measures of consumption are used: (i) food consumption (purchased, self-produced or received as gifts), and (ii) total consumption (food consumption plus expenditures on transportation, utilities, clothes, health and furniture on a monthly basis). Presumably, food consumption is more stable (e.g., less elastic) than total consumption. For instance, Skoufias (2003) finds that food consumption tends to be less responsive to shocks than total consumption. We divided these two consumption measures by the number of household members in order to get consumption per adult equivalent. Children under 12 years old are treated as equivalent to 0.5 adults . We calculate the change in the per adult equivalent consumption, $\Delta c_{i,c,t}$, for household i, in community c, at time t, using Equation (2):

$$\Delta c_{i,c,t} = [\ln(c_{i,c,t} / IPC_t) - \ln(c_{i,c,t-n})] / n \quad (2)$$

where IPC_t is the price index used to obtain consumption in constant terms,[1] and n is the adult equivalent number of household members.

We measure income in two distinct ways—income from labor activities and total income. In both cases, in order to get monthly income, we divide the annual income evenly. For rural areas we calculate the net profit as the difference between all agricultural income and the direct costs of production. We assume homogenous expenditure throughout the year. The per-capita income of the household is derived in the same way as the per-capita consumption (Equation 2), so that we can obtain the change in the income in constant terms, $\Delta y_{i,c,t}$. As noted above, García-Verdú (2000) uses only total income as a way to overcome the problem. Despite this difficulty, we decide to report results for both labor income (as described above) and total income in order to see differences in responses. Appendix 1 presents details of construction of the income variables.

Besides income variables, other variables of interest are those capturing negative shocks. Our definition of shock is any event in which the family has to invest unexpectedly certain amount of resources, or any event that unexpectedly signifies a lost of resources / income. Based on the data, we have derived three different types of shocks. The first set measures unexpected illnesses and health shocks. The second set measures unexpected

[1] Implicitly, $IPC_{t-n} = 1$.

labor and business shocks. Finally, the third set measures other shocks such as shocks to agricultural production or violence. [2]

There is one caveat when analyzing the impacts of the various shocks. The occurrence of the specific shock and the time period of consumption may not fully overlap. For example, suppose that the shock is the household head falling ill. If the shock was *very* recent (last day of the reporting period) then the effect of the shock may not have been felt yet in that particular consumption period. The inability to construct a very detailed timeline poses a serious problem in the estimation. This problem that has been pointed out in several of the previous attempts to test the hypothesis of income smoothing (for instance, see Cochrane, 1991).

We separated shocks by rural and urban households. Intuitively, certain shocks are important for rural families, such as crop lost, and some of them are more important for urban families, such as unemployment, assuming that rural families are self-employed and they work in their land, and that income in urban families depend more in employment of its members. In any case, we constructed an ample set of variables for proxy to shocks commonly found in the literature (see, for instance, Cochrane, 1991; Morduch, 1995; Kochar, 1998; and Gill and Ilahi, 2000)

The empirical test for consumption smoothing consists of checking consumption, *c*, responses to negative variations in income, *y*. Out of the different specifications used in the literature, the consumption insurance test usually regresses the changes in the log of consumption against changes in the log of income. Mathematically,

$$\Delta c_{i,j,t} = \beta_0 + \beta_1 \Delta y_{i,j,t} + I(\beta_0^I + \beta_1^I \Delta y_{i,j,t}) + \mathrm{B}_1 X_{i,j,t} + \mathrm{B}_2 FE_{j,t} + \varepsilon_{i,j,t} \qquad (3)$$

In Equation (3) $X_{i,j,t}$ is the vector of characteristics of household i, in community j, at time t. The set of household characteristics includes the age of the household head, the average household education (based on individuals over 17 years of age), and the number of individuals in the household.[3] To control for geographically covariant consumption movements we include fixed effects, $FE_{j,t}$, by regions in Nicaragua and municipalities in Colombia.

When the households are able to insure themselves against all types of risks, we would expect $\beta_1 = 0$. That is, income fluctuations do not induce consumption fluctuations. In a

[2] Notice that all these shocks are self-reported. The general form of the questions is, "Has any member of the household experienced X phenomena in the given time period?" For example, one specific question asked was, "Has any member of your family suffered from a health problem in the last month?" For some of the other shocks there is no direct question and they are generated from information in the survey. For example, unemployment is built using the standard procedure to construct the variable.

[3] These variables are included in order to reduce the variance in consumption changes. Derived from several microeconomic models, they are presumably determinants of consumption patterns across households. In any case, the coefficient estimates do not change with the inclusion or exclusion of these controls.

world with only saving, this implies that households save when they have higher than average income, and they spend savings when their income is lower than average.

In Equation (3), I is an indicator used to determine if a particular group of observations, such as low income households, has a different consumption smoothing parameter than the overall one, β_1. This indicator is assumed to be zero for everyone. If we expect, however, that households with different characteristics have differing abilities to insure themselves then the inclusion of I is fundamental. For example, if low-income families do not have access to capital markets or other risk-sharing institutions and thus are more limited in their abilities to counter the impacts from income fluctuations on consumption we would set I=1 for low-income households and I=0 for high-income households to test the importance of such limitations. We would expect that $\beta_1^I > 0$.

The two groups for which we tested differences in responses to income fluctuations are owners of house and families with negative change in income. The rationality to include owner of house (versus no-owners) is that the house can serve as collateral in times of negative shocks (Soto, 2000). Negative change in income is included to investigate if families that will not have access to credit markets will reduce their consumption vis-à-vis a negative change in income. In contrast, we do not expect any response of consumption when income increases (Zeldes, 1989). Finally, for the case of Colombia we include the participation (or not) to the program Familias en Accion. In principle Familias en Accion is a *permanent* increase in the family income, and we expect to see a close respond of consumption to the participation of the household in the program.

As discussed in Morduch (1999), measurement error in income may lead to "attenuation bias." In short, such errors may lead to lower estimates of β_1 in Equation (3). Moreover, if some of the tested groups are more prone to income measurement error, then β_1^I estimates will be biased. In the results we discuss the implication of this problem.

Even if there are no differences across households in terms of self-protection and insurance usage, households may face different types of shocks. Therefore we estimate equations of the following form:

$$\Delta c_{i,j,t} = \varphi_0 + \varphi_1 S_{i,j,t} + I(\varphi_0^I + \varphi_1^I S_{i,j,t}) + \Gamma_1 X_{i,j,t} + \Gamma_2 FE_{j,t} + \eta_{i,j,t} \qquad (4)$$

where $S_{i,j,t}$ stands for a particular shock in household i, in community j, at time t. The shocks for which we test Equation (4) are health problems, labor market status changes, natural phenomena and violence. Again we control by household characteristics ($X_{i,j,t}$) and fixed effects ($FE_{j,t}$) by region in Nicaragua and by municipality in Colombia.

Similarly as in Equation (3), we want to first investigate what types of idiosyncratic shocks translate into general consumption fluctuations. $\varphi_1 \neq 0$ indicates the impact of a specific shock. Second, we want to investigate if these shocks have differential impacts

among different types of households (owner of house and negative income changes). These differential impacts are captured by $\varphi_1^I \neq 0$.

4. Data and Results

Two set of results are presented. First, the article presents the response of the change in consumption to changes in income. In general, we find a low, but statistically significant response of consumption to income changes. The response is asymmetrical to the sign of the change in income. Indeed, there is some evidence that households respond to reduction to income, and do not consume positive income changes. Second, the study presents the response of the change in consumption to several specifications of shocks. Both Colombia and Nicaragua show consumption responses to labor shocks and, in the case of Colombia responses to health shocks.

a. Data

Data used in the literature for hypothesis testing vary in the number of repeated observations, and in the time span between the data rounds. For instance, order to augment the number of households having experienced shocks Cochrane (1991) tests consumption growth against negative shocks based on two rounds of data three years apart. García-Verdú (2002) uses two years of data with one year in between the sets. Townsend's (1994) estimation for rural India took advantage of a dataset of 40 households observed over a 10 year period.

In general, the dependant variables used are changes in food consumption, total consumption and non-food consumption. When income is used as an independent variable, it is mostly measured as *total* income. García-Verdú (2000) explains the use of total income as a strategy to "avoid the problem that many respondents report zero income if they are not employed in the formal sector" (p. 18). When shocks are included as independent variables they have always been negative shocks such as sickness of a household member.

This paper uses household panel datasets from Nicaragua and Colombia. To the best of our knowledge these are the first analyses of consumption insurance for each of these countries. The Colombian panel comprises of two rounds of data collected in 2002 and 2003 with information from 10,783 repeated households. The sample was not designed to statistically represent any regional or the national population. The attrition rate between the two rounds was of 6.5%. The data were collected for the evaluation of the *Familias en Acción* (FA) program, a government-funded cash-transfer to poor households conditional on the consumption of preventive health care services and basic education. The program was targeted to households residing in towns with less than 100,000 inhabitants, with sufficient school and health care facilities, and at least one bank where the cash payments could be made. Eligible households had at least one member with less than 17 years and with a SISBEN score, a means-test instrument, equal to one. The SISBEN score is derived from information on the infrastructure of the dwelling unit (type of floor and connection to the water and sewer networks, etc.) and on some human capital

measurements (such as education of the head of the household and ratio of children to adults). According to Attanasio et al. (2005), SISBEN 1 corresponds to the poorest 20% of households in Colombia.[4] It is important to indicate that the transfer was not random, and families auto-selected into the program.

For evaluation purposes, data were collected from treatment and control towns that were comparable in demographic and socioeconomic characteristics. The available data provide a rich set of variables that allow us to measure total consumption, consumption of non-durables, total income, and labor income, as well as different income shocks for both rural and urban households.[5]

The Nicaraguan panel comprises of two years of data collected in 1998 and 2001, with information from 3,086 repeated rural and urban households. This survey is part of the Living Standard Measurement Surveys (LSMS) by the World Bank (for details about the surveys, see http://www.worldbank.org/lsms/). The attrition rate between the two rounds was of 27.1%.The survey has detailed information on total consumption, the consumption of non-durables, total income and labor income, as well as information on different income shocks. In contrast with the Colombian survey, this is a representative sample at the national level. In terms of attrition, there are statistical differences between the households surveyed twice and those only surveyed once.

Table 1 shows the mean of the per-capita household consumption and income in both countries. In the Colombian sample both the mean consumption per capita and the mean labor income fell between 2002 and 2003. In Nicaragua, both mean consumption and income per capita increased between 1998 and 2001.

It is necessary to highlight one important feature of the Colombian data: labor income is reported only in approximately 50% of the sample. Recall that the Colombian survey is mainly rural, and the definition of a "formal labor income" is quite complex in the presence of informal contracts. Moreover, an important part of the payment in the rural area comprises of in-kind retribution.

b. Consumption responses to idiosyncratic income changes

Results for Equation 3 are shown in Table 2. The Table presents estimates of the β_1 and β_1^I in Equation 3 for four combinations of the two measures of consumption change (food consumption and total consumption) against the two measures of idiosyncratic income changes (labor income and total income). As stated before, each specification

[4] The program transfers money to a household conditional on several factors. Children below 5 years old need to undergo periodic health check-ups and children between 5 and 17 years old need to prove school attendance in order for the household to receive the transfer. The money transferred differs according to the level of education of the children (primary and secondary). See Attanasio et al. (2005) for a description of the program.

[5] There is evidence that the attrition rate in the Colombian panel is not random. Indeed, we find some evidence of difference in means in some variables. .

includes dummies for those households who own their house (1= owner), for negative income shocks (1= negative per capita income change between the two periods, to separate from households with positive income change), and for households that participate in the *Familias en Acción* in the Colombian sample. All regressions control for the age of the household head, the average household education (based on individuals over 17 years of age), and the number of individuals in the household.

Although we reject full consumption insurance with idiosyncratic income shocks, our estimates suggest a significant amount of risk sharing in both the Nicaraguan and the Colombian samples. The coefficient of total consumption growth rate versus the total income growth rate is 0.075 for Colombian households and 0.091 for Nicaraguan households. More over, almost all estimates of the coefficient of consumption growth versus income growth are statistically significantly different from zero at 90% level of confidence. Results are similar when dividing the sample into urban and rural households (Table 3 and Table 4).

Total consumption of urban households was more responsive than rural consumption (Table 3 and Table 4) in both samples The difference between urban and rural household responses is more pronounced in the Nicaraguan sample than in the Colombian one. For instance, Colombian's coefficients are 0.026 (labor income) and 0.068 (total income) for rural areas, whereas the respectively coefficients for urban zones are 0.037 and 0.082. The coefficients in the Case of Nicaragua are, for the rural areas 0.049 and 0.058 and 0.12 and 0.14 for the urban areas. Given that the Nicaraguan sample is representative at the national level and that the Colombian sample is biased towards rural areas and small towns this difference may signal a possible bias caused by measurement errors. If rural areas are more prone to measurement error then it is possible there is a bigger attenuation bias in rural areas.[6] However, we do not have any priors to assess the relative size of the measurement error in rural versus urban areas.

In general, homeowners do not seem to smooth consumption more than renters[7] neither when all the households are considered together nor when the sample is divided into rural and urban households (Table 3 and Table 4). [8] In short, apparently the ownership of households does not help families to smooth consumption. One conjecture about this result is the lack of depth in the finantial market and the lack of clear property rights over house (see Soto, 2000)

It is important to distinguish between consumption responses to positive or negative idiosyncratic shocks in income. It can be argued that households find more restrictions in responding to losses (for example they do not have the savings in response to a large shock) than to gains (Zeldes, 1989). To investigate this issue we identify households

[6] We thank Enzo Luttmer for pointing out this conjecture.
[7] The Nicaraguan survey allows pinpointing householders with ownership title since the survey identifies people who report being an owner with the title or an owner without the title, whereas the Colombian survey only captures self reported owners, without specifying if the household has the title or not
[8] The only exception to this general finding is that in the sample of all Nicaraguan households we observe the result that homeowners smooth less food consumption than renters when faced with changes in total income (Table 2)

whose income dropped between the two surveys. The results from both the urban and rural samples in Nicaragua suggest that households adjust their consumption to both positive and negative shocks to income. The Colombian results, however, suggest consumption shifts only from negative shocks but not from positive income shocks. In the Colombian rural sample positive shocks seem to shift consumption, *either total or just food consumption*, when there are fluctuations in the *total* income. In any case, the coefficients of negative shocks are bigger, in magnitude, than the positive ones.

We also look at the differences across the four specifications (i.e. two consumption variables and two income variables). We discuss the results for the consumption variables first and then the results for the two income variables. Theoretically, food consumption is less elastic than total consumption, and therefore, we expect food consumption to respond less to income changes than total consumption. For instance, households would prefer to reduce consumption of leisure to cope with an income drop rather than to reduce food consumption. This pattern is in line with the data, for both rural and urban areas from both countries. In both Colombia and Nicaragua, the coefficient of food consumption growth against income growth is systematically lower than the coefficient of total consumption growth against income growth. The coefficient for food consumption versus labor income is 0.027 and 0.072 for Colombia and Nicaragua respectively, whereas the coefficients of total consumption versus labor income is 0.034 and 0.082. Similar pattern emerges for total income.

Furthermore, the pattern remains in the urban and rural samples. For instance, in the urban areas, the coefficients for total income in the food consumption specification are 0.071 and 0.12 in Colombia and Nicaragua, respectively (Table 3) and for total consumption they are slightly higher 0.08 and 0.14, respectively. Similar results emerge in the rural area samples as well (Table 4).

In addition, we analyze the asymmetries in consumption responses to the two different definitions of income. For both countries and zones (rural and urban) consumption responds more to total income changes than to labor income changes. For instance, in Colombia using the whole sample the point estimates in the labor income regressions for food consumption and total consumption are 0.027 and 0.034, in comparison with estimates of 0.065 and 0.075 in the total income regressions (Table 2). The same statistics for Nicaragua are 0.072 and 0.082 versus 0.079 and 0.091. Similar trends are obtained in the rural and urban sub-samples.

One potential explanation of the result is a mechanical one. Since total income is the sum of labor and other income, it is possible that the coefficient reflects the participation of labor income in the total income, reducing the size of the coefficient. Another possible explanation for the results is that, from a formal labor contractual point of view, labor income tends to be more stable than total income, and therefore, we would expect a smaller response in consumption to changes in labor income. In some sense, it may be the case that "income smoothing", via labor contracts, allows consumption smoothing[9].

[9] The calculations of income differ between the two countries. The Nicaraguan survey is very detailed on labour income sources, and gathers information on principal job, secondary job and other labour income;

Our final result, based on Equation 3, is informative on evaluating the *Familias en Accion (FA)* program. The treatment and control group setup of the Colombian data allows the comparison of households that get a *Familias en Accion* payment, in the second period, from those who do not. The coefficient that captures any differences in the responses of these two groups is not significant in any of the specifications. Accordingly, it seems that FA does not help households to smooth consumption, despite the fact that there is clear evidence that it helps the household consume more (see Attanasio et al., 2005). The result is consistent with the hypothesis that households perceive income from *Familias en Accion* as a transitory income.

c. Consumption against idiosyncratic shocks

Table 5 and Table 6 show the incidence of shocks for Colombia and Nicaragua, respectively. We find significant differences of these shocks across areas (rural / urban) within each country.

As stated below, we consider three types of shocks: health; labor and business; and natural disasters and violence shocks. Table 5 and 6 present means and standard errors of the shocks. Health shocks are measured by: (i) the presence of sick individuals in the household during the period of analysis with separate measures if the sick individual is "any member" of the household, the "household head," or "a child"; (ii) the death of any member of the household during the period of analysis; and (iii) childbirth, which we could only test for the Colombian case.

Labor and business shocks are measured in three ways. First we use as a measure the proportion of unemployed working-aged household members. We generate two different indicators of this measure: (i) an indicator whether the unemployed proportion is higher than the sample mean and (ii) the sum of working-aged unemployed household members. The second type of measure of labor shocks is an indicator of unemployment of household head in any of the two periods. The third measure is an indicator of whether the household lost a household business in any of the two periods of analysis. This last measure is only available for the Colombian case.

In the third set of shocks we include natural disasters and violence. The indicator for exposure to a natural disaster for the Nicaraguan household sample is whether or not the household experienced drought, plague, flood or volcanic gases. For the Colombian households it is whether or not the household experienced a "catastrophe." (The Colombian definition may, or may not, include all of the events listed in the Nicaraguan survey.) Exposure to violence is measured in the Nicaraguan sample as having been a victim of a criminal offence (such as extortion, robbery, etc.) and for the Colombian sample, as having been a victim of violence in general.

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the Colombian survey only asked for principal job income and just includes one question about the amount of money the person received from work.

Table 7 and Table 8 present the results from the analysis of consumption changes due to idiosyncratic shocks for Colombia and Nicaragua, respectively. We report two columns, one with the φ_1 coefficient from Equation (4) and the other with the coefficient φ_1^I for urban areas (I is one in urban areas, 0 otherwise.). A general result is that, despite the effort to capture different types of shocks, few of them have a statistical relationship with the changes in consumption. Presumably, this patter can be explained by measurement problems and magnitude of the shocks, as Table 5 and 6 shows. Indeed, some of the shocks are very infrequent events

Health shocks are important in the case of Colombia, especially the death of any member of the household. In contrast, for Nicaragua none of the health shocks are significant. but, crop loss, drought, and other natural disasters are important sources of consumption fluctuation, specifically for total consumption. We do not find any relationship between natural disasters and consumption in Colombia. The only "unexpected" result is the relationship between violence and consumption in Colombia. For the total sample, violence is not correlated with changes in consumption. However, the coefficient on the urban dummy is significant and positive, contrary to the expectation of a negative coefficient. Again, the result may be a problem of variable definition.

Labor shocks are important in explaining consumption fluctuations in both countries. For the Nicaragua sample we define a labor shock as the proportion of unemployed members in the household. Changes in consumption are negatively related with this variable, especially in urban areas. For Colombia, we have three labor shock specifications. First, we use the standard definition of unemployment for any person in the household 18 years old or more who is not working and is looking for job, and then we restrict the definition to unemployment of the head of the household. We did not find that consumption responses to these two specifications. The third definition of labor shock for Colombia is derived directly from a survey question asking whether or not the household had experienced either a labor or crop shock. Given the question format we cannot differentiate between these two types of shocks. Nonetheless, in urban areas, where shocks to crops are not expected to affect households, we find a negative relationship between the change in consumption and this variable, with a coefficient of -0.079 and -0.072 for food and total consumption respectively. In the case of Nicaragua, we found consumption responses to unemployment in urban areas (coefficient of -0.033), and responses to crop lost (-0.037).

5. Conclusions

This paper uses two panel datasets, one from Colombia and the other from Nicaragua, in order to run the consumption insurance test against negative idiosyncratic shocks. First we test consumption responses to income changes, and then to negative idiosyncratic events. We also test to see if there are differences in consumption insurance among different types of households (urban vs. rural). We use two definitions of consumption—food consumption and total consumption–and two income specifications—labor income and total household income.

Households from both the Colombian and Nicaraguan samples show an *imperfect but remarkable level of consumption smoothing against idiosyncratic shocks*. We find that consumption responds more to total income changes than to labor income changes. The responses to idiosyncratic shocks are slightly different in the two countries. In Nicaragua consumption responds to agricultural shocks, whereas in Colombia consumption responds to health shocks. In both countries labor market shocks affect household consumption. As expected, food consumption responds less than total consumption to both shocks and income drops.

In the face of income shocks, consumption of urban households is more responsive than of rural households. Given that the capacity for smoothing consumption not only depends on the capacity to smooth income, but also on access to formal and informal risk coping mechanisms it is possible that that income volatility related to the urban informal labour market might be high; also, it can be argued that informal insurance institutions in the rural areas are stronger than in urban areas. Surprisingly, house ownership has no effect on consumption smoothing, suggesting it may be liquid assets that are needed rather than assets. In order to assess asymmetries in consumption insurance, a dummy is used to separate households with positive versus with negative income variation. Results show that households in Nicaragua respond symmetrically to positive and negative income shocks, but Colombian households react asymmetrically. In Colombia consumption responds to negative income shocks, but *does not* respond to positive shocks.

The findings of this paper raise the question of how households achieve consumption smoothing, assuming limited access to the banking system and to welfare services from households in the two countries. In short, such a low level response of consumption to income and several types of shocks are puzzling, given the hypothesis of several market failures and incomplete markets in less developed countries. Perhaps empirical estimates on informal insurance strategies can provide some clues for such a paradox.

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Table 1.

Household consumption and income

Colombia	2002		2003	
	Mean	Std.	Mean	Std.
Per capital, food consumption	49,831	37,081	46,060	31,034
Per capital, total consumption	66,125	46,779	61,189	40,340
Per capital, labor income	30,588	46,458	28,395	278,278
Per capital, total income	54,221	58,419	63,889	291,433
US$ exchange rate				
2002	2,506			
2003	2,877			

Nicaragua	1998		2001	
	Mean	Std.	Mean	Std.
Per capital, food consumption	301	391	350	317
Per capital, total consumption	476	611	668	853
Per capital, labor income	437	1,157	689	1,581
Per capital, total income	452	1,168	775	1,863
US$ exchange rate				
1998	11			
2001	13			

Source: authors' calculations

Table 2.

Total sample
Change in consumption versus change in income
Coeficient β_1

Colombia

	Food consumption versus labor income				Food consumption versus total income				Total consumption versus labor income				Total consumption versus total income			
β_1	0.027 *	0.030 *	-0.010	0.031 *	0.065 *	0.074 *	0.015	0.065 *	0.034 *	0.041 *	-0.015	0.037 *	0.075 *	0.083 *	0.017 *	0.078 *
	0.008	0.013	0.020	0.012	0.006	0.010	0.010	0.009	0.007	0.012	0.019	0.011	0.005	0.010	0.009	0.009
β_1, ownership of house (1=yes)		-0.004				-0.014				-0.011				-0.012		
		0.016				0.012				0.015				0.011		
β_1, negative income change			0.047 *				0.059 *				0.049 *				0.074 *	
			0.023				0.016				0.022				0.015	
β_1, "Familias en Accion" (1=yes)				-0.007				0.000				-0.006				-0.006
				0.016				0.012				0.014				0.011
Number of observations	4,928	4,928	4,928	4,928	10,237	10,237	10,237	10,237	4,966	4,966	4,966	4,966	10,303	10,303	10,303	10,303

Nicaragua

	Food consumption versus labor income				Food consumption versus total income				Total consumption versus labor income				Total consumption versus total income			
β_1	0.072 *	0.056 *	0.044 *		0.079 *	0.048 *	0.023		0.082 *	0.078 *	0.048 *		0.091 *	0.077 *	0.037 *	
	0.012	0.018	0.021		0.011	0.016	0.018		0.012	0.018	0.022		0.010	0.015	0.017	
β_1, ownership of house (1=yes)		0.029				0.056 *				0.007				0.025		
		0.024				0.022				0.024				0.020		
β_1, negative income change			0.032				0.084 *				0.030				0.069 *	
			0.037				0.036				0.037				0.033	
Number of observations	2563	2563	2563		2866	2866	2866		2604	2604	2604		2870	2870	2870	

Source: authors' calculations
* Significant at 90% confidence interval

Table 3.

Urban sample

Change in consumption versus change in income

Coeficient β_1

Colombia

	Food consumption versus labor income				Food consumption versus total income				Total consumption versus labor income				Total consumption versus total income			
β_1	0.023 *	0.028	-0.007	0.026	0.071 *	0.089 *	0.003	0.072 *	0.037 *	0.048 *	-0.013	0.034 *	0.082 *	0.096 *	0.008	0.084 *
	0.011	0.019	0.026	0.016	0.008	0.014	0.014	0.012	0.01	0.017	0.024	0.015	0.008	0.013	0.013	0.011
β_1, ownership of house (1=yes)		-0.007				-0.028				-0.016				-0.022		
		0.022				0.017				0.021				0.016		
β_1, negative income change			0.024				0.095 *				0.041				0.099 *	
			0.031				0.022				0.029				0.021	
β_1, "Familias en Accion" (1=yes)				-0.006				-0.002				0.006				-0.004
				0.022				0.017				0.020				0.016
Number of observations	2733	2733	2733	2733	5112	5112	5112	5112	2765	2765	2765	2765	5160	5160	5160	5160

Nicaragua

	Food consumption versus labor income				Food consumption versus total income				Total consumption versus labor income				Total consumption versus total income			
β_1	0.107 *	0.088 *	0.081 *		0.122 *	0.092	0.057 *		0.120 *	0.114 *	0.091 *		0.140 *	0.134 *	0.081 *	
	0.016	0.026	0.029		0.016	0.026	0.028		0.016	0.026	0.029		0.014	0.023	0.025	
β_1, ownership of house (1=yes)		0.030				0.046				0.007				0.010		
		0.033				0.032				0.033				0.029		
β_1, negative income change			0.010				0.077				-0.001				0.063	
			0.048				0.049				0.048				0.045	
Number of observations	1522	1522	1522		1670	1670	1670		1547	1547	1547		1674	1674	1674	

Source: authors' calculations

* Significant at 90% confidence interval

Table 4.

Rural sample

Change in consumption versus change in income

Coeficient β_1

Colombia

	Food consumption versus labor income				Food consumption versus total income				Total consumption versus labor income				Total consumption versus total income			
β_1	0.030 *	0.019	-0.021	0.026	0.059 *	0.057 *	0.030 *	0.056 *	0.026 *	0.015	-0.027	0.024	0.068 *	0.067 *	0.030 *	0.072 *
	0.011	0.020	0.032	0.019	0.008	0.015	0.014	0.014	0.010	0.019	0.030	0.017	0.008	0.014	0.013	0.013
β_1, ownership of house (1=yes)		0.016				0.003				0.015				0.000		
		0.024				0.018				0.022				0.016		
β_1, negative income change			0.077 *				0.019				0.063 *				0.047 *	
			0.037				0.024				0.034				0.022	
β_1, "Familias en Accion" (1=yes)				0.006				0.005				0.003				-0.007
				0.023				0.018				0.021				0.016
Number of observations	2195	2195	2195	2195	5125	5125	5125	5125	2201	2201	2201	2201	5143	5143	5143	5143

Nicaragua

	Food consumption versus labor income				Food consumption versus total income				Total consumption versus labor income				Total consumption versus total income			
β_1	0.040 *	0.035 *	0.030		0.049 *	0.026	0.023		0.049 *	0.054 *	0.033		0.058 *	0.050 *	0.035	
	0.018	0.025	0.032		0.016	0.022	0.025		0.019	0.026	0.033		0.015	0.020	0.024	
β_1, ownership of house (1=yes)		0.011				0.047				-0.012				0.015		
		0.036				0.031				0.037				0.029		
β_1, negative income change			0.035				0.062				0.036				0.034	
			0.057				0.053				0.060				0.049	
Number of observations	1041	1041	1041		1196	1196	1196		1057	1057	1057		1196	1196	1196	

Source: authors' calculations

* Significant at 90% confidence interval

Table 5.
Colombian shocks

	Total sample		Rural		Urban		Difference
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Stad. Dif.
Health shock	0.505	0.005	0.492	0.007	0.517	0.007	yes
Health shock, head of the household	0.372	0.005	0.396	0.007	0.349	0.007	yes
Health shock, children	0.342	0.005	0.349	0.007	0.334	0.006	no
Dead of any member	0.086	0.003	0.085	0.004	0.087	0.004	no
Birth of child	0.222	0.004	0.231	0.006	0.212	0.006	yes
Labor shock 1, unemployment	0.074	0.002	0.050	0.002	0.099	0.003	yes
Labor and crop lost	0.142	0.004	0.180	0.006	0.104	0.005	yes
Labor shock, head unemployment	0.068	0.002	0.041	0.003	0.096	0.004	yes
Business lost	0.009	0.001	0.008	0.001	0.009	0.001	no
Violence shock	0.013	0.001	0.014	0.002	0.012	0.002	no

Source: Authors' calculations

Table 6.
Nicaragua shocks

	Total sample		Rural		Urban		Difference
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Stad. Dif.
Health shock	0.680	0.008	0.707	0.012	0.659	0.011	yes
Health shock, head of the household	0.689	0.008	0.686	0.013	0.692	0.011	no
Health shock, children	0.386	0.009	0.463	0.014	0.327	0.011	yes
Dead of any member	0.084	0.005	0.083	0.008	0.085	0.007	no
Labor shock 1, unemployment	0.674	0.008	0.746	0.012	0.620	0.012	yes
Labor shock 2, unemployment	0.649	0.008	0.718	0.012	0.596	0.010	yes
Labor shock, head unemployment	0.461	0.009	0.474	0.014	0.451	0.012	no
Croop lost, driout, etc	0.405	0.009	0.756	0.012	0.140	0.008	yes
Violence shock	0.011	0.002	0.020	0.004	0.004	0.002	yes

Source: Authors' calculations

Table 7.

Colombia

Change in consumption versus shocks

Coeficient γ_1

	Food consumption		Total consumption	
	γ_1	Coeficient $\gamma_{1\,,}$ urban	γ_1	Coeficient $\gamma_{1\,,}$ urban
Health shock	-0.030301 *	0.039835	-0.026679	0.032082
	0.018209	0.025804	0.017108	0.024209
Health shock, head	0.017797	-0.008922	0.01815	-0.004432
of the household	0.018865	0.026837	0.017721	0.024181
Health shock,	0.012176	0.030705	0.015307	0.015695
children	0.019225	0.0273	0.018066	0.025611
Dead of any	-0.088689 *	0.061175	-0.101725 *	0.041085
member	0.02388	0.046233	0.030769	0.043201
Birth of	-0.028057	0.026869	-0.025018	0.02985
child	0.022201	0.031147	0.020857	0.029241
Labor shock 1,	0.014064	0.002587	0.009838	-0.001731
unemployment	0.025692	0.032585	0.024164	0.030604
Labor and crop lost	0.034171	-0.07858 *	0.0219	-0.071646 *
	0.022387	0.035219	0.021041	0.033002
Labor shock,	-0.048305	0.053836	-0.042696	0.043612
head unemployment	0.04636	0.055783	0.043543	0.052328
Business lost	-0.005089	0.006751	0.005039	0.029378
	0.099826	0.137962	0.093972	0.129818
Violence shock	-0.042177	0.151654	-0.011341	0.211651 *
	0.073852	0.10957	0.069486	0.100886

Source: Authors' calculations

Table 8.

Nicaragua

Change in consumption versus shocks

Coeficient γ_1

	Food consumption			Total consumption		
	γ_1		Coeficient γ_1 , urban	γ_1		Coeficient γ_1 , urban
Health shock	0.000		0.011	0.010		-0.013
	0.142		0.018	0.015		0.019
Health shock, head of the household	-0.018		0.028	0.006		-0.003
	0.014		0.018	0.015		0.019
Health shock, children	-0.002		0.012	-0.015		0.011
	0.134		0.018	0.014		0.018
Dead of any member	-0.022		0.022	0.004		0.005
	0.024		0.031	0.025		0.032
Labor shock 1, unemployment	-0.025	*	0.021	0.005		-0.030
	0.015		0.020	0.016		0.021
Labor shock 2, unemployment	-0.019		0.013	0.006		-0.033 *
	0.015		0.019	0.016		0.020
Labor shock, head unemployment	0.002		-0.014	0.013		-0.024
	0.013		0.017	0.014		0.018
Croop lost, driout, etc	-0.012		0.007	-0.037	*	0.024
	0.016		0.022	0.016		0.023
Violence shock	0.049		0.024	0.054		-0.050
	0.046		0.100	0.048		0.105

Source: Authors' calculations

APPENDIX 1

Definition of income variables

Nicaragua:

Labor income: income from principal, secondary and "other" job + income from commissions, principal, secondary and other job + income for 13th month (e.g. vacation bonus) from principal, secondary and other job + other income from work.

Total income: labor income + income from renting house and car + income from scholarships + income from family transfers + income from alimony + income from pensions + income from capital gains + income from general insurances + income from unemployment insurance + income from lottery and gamble + income from gifts + (income from farming activities – cost of inputs in farming activities)

Colombia:

Labor income: income from principal job

Total income: labor income + "net" income from family business (including farming activities) + income from pensions + income from capital gains + income from other sources (different than labor income) + income from transfers (in cash)