CONSUMPTION SMOOTHING AND POVERTY VULNERABILITY
IN RURAL MEXICO

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By

Omar F. del Valle Colosio, B.A.

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I would like to use this space to thank God for giving me strength and courage during my graduate studies; I thank my family for its tremendous support and confidence. Finally, the research and writing of this thesis is also dedicated to everyone who helped along the way; Special gratitude to Pavel Luengas who gave me tremendous insight.

Many thanks,

Omar F. del Valle Colosio
CONSUMPTION SMOOTHING AND
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Omar F. del Valle Colosio, B.A.

Thesis Advisor: Gregory Acs, Ph.D.

ABSTRACT

This thesis examines whether “Progresa”, a cash transfer program in Mexico, functions as a food consumption smoothing mechanism against negative income fluctuations caused by idiosyncratic shocks in health or environment. It also analyses if the program has crowded-out informal private transfers received by family members living outside household for more than five years. Using panel data, I find that families participating in Progresa are more able to smooth consumption than non-participating families. Consumption is responsive to income fluctuations but not by a large amount. Moreover, consumption is largely responsive to the presence of idiosyncratic shocks; however, different environmental shocks have different impacts on consumption. Finally, there is evidence that private transfers are not responsive to the presence of the program; therefore, there is no crowding-out effect.
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INTRODUCTION

Low income families around the world are vulnerable to catastrophic and unfortunate events that lead to significant income losses. While higher income families can draw down assets, use savings or borrow money to keep their consumption level stable, poor families lack access to cost-effective financial instruments to insure themselves against negative events.

“Poverty vulnerability”\(^1\) refers to the risks poor people face which lead to a sudden drop in income and later to a decrease in consumption; these risks include the absence of the head of households (either because of death or abandonment), unemployment, health problems, or the loss of agricultural crop.

Nevertheless, there are different informal strategies to manage risks. The most common strategies are the depletion of assets, increasing the level of working hours, or informal borrowing. Additionally, public interventions, through social policies, aim to help poor households maintain their income and consumption levels, and to displace non-desirable coping strategies (i.e. child labor and traditional money lenders).

This research analyzes changes in the level of poor household’s consumption when it faces negative shocks in income, and other unfortunate events. By using panel data, I am able to: (1) evaluate if the main cash transfer program of Mexico,  

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\(^1\) The Agency of International Strategy for Disaster Reduction of United Nations, defines vulnerability as the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community, a family or individual to the impact of hazards; poverty vulnerability is the susceptibility poor families or individual face because of their inability to cope with such conditions or factors.
“Progresa”, functions as a consumption smoothing mechanism, and (2) to analyze if the program has crowded-out informal safety nets such as private transfers.

Progresa, since its establishment in 1997, has provided cash transfers to selected poor families in marginal rural communities, conditional on their children using health facilities on a regular basis and attending school. The program has gathered information from families across different rounds of surveys in order to make program evaluations; therefore, the information on the program comes from two groups: treatment and control. In the absence of the treatment, income and consumption of both types of families can be considered to be similar. For the purpose of this research, the main difference between groups is for treatment families to have an additional source of income against negative shocks.

This study analyses the relationship between the percentage change in consumption on the percentage change in income for the period of October 1998 to October 1999. One of the most important findings in this research is that there is a statistically significant difference on consumption smoothing for treated families.

Additionally, by controlling for household characteristics, the percentage change in consumption is responsive to the percentage change in income. This relationship does not change when other factors that might influence consumption are held constant (i.e. household size, environmental and health shocks).

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2 Detailed information about the background of the program and the mechanism of selecting families is provided in the Appendix A of this document.
Finally, the findings imply that Progresa has not crowded-out the amount of private transfers received by families within both groups.

The analysis in this research document implies that Progresa, despite not being a consumption insurance program, helps treated families to smooth consumption. Therefore, the evidence suggests that the program could be expanded to other poor families to reduce their vulnerability against negative income fluctuations, and other idiosyncratic shocks they may suffer. Moreover, this type of public intervention does not harm traditionally informal safety nets as private transfers.
I. LITERATURE REVIEW

1.1 Poverty vulnerability

Individuals and households that lack the means to meet their basic needs in terms of health, housing, nutrition, and education, are considered to be poor by international standards; this is, living with less than US $1 a day. However, this approach does not consider the influential power of uncertainty on poverty.

From the perspective of this paper, poverty vulnerability means poor families are at greater risk of becoming poorer when they face harmful shocks that could lead to a sudden drop in income. Therefore, considering uncertainty in the study of poverty adds another component to the research of social and economic development (Morduch, 1994).

Moreover, when poor families are not able to manage unexpected and harmful shocks (i.e. unemployment, health problems, environmental shocks, loss of agricultural crops), they face drops in their consumption level, leading the poor into a downward spiral, and making it more difficult to overcome their condition (Morduch 1994, 1995; García Verdú, 2002).

Therefore, to secure their level of consumption once they face negative shocks (explicitly in income), poor households have traditionally engaged in different strategies and mechanisms, or if available, they participate in government social assistance. This process of maintaining consumption against negative shocks is known as consumption smoothing.
This is how consumption smoothing and poverty vulnerability are related in the literature of the study of economics of poverty and economics of uncertainty (Morduch 1994). After providing a more detailed explanation of these technical terms, I describe the risks poor families face, and discuss the variety of resources they rely on to manage them.

1.2 Risks or vulnerability

From the perspective of consumption smoothing and poverty vulnerability, being at risk or being vulnerable against uncertain or unexpected events are similar conditions; poor households are in danger of becoming even poorer when harmful events happen; thus, for practical purposes of this paper, risk and vulnerability are used for the same context.

Risks can be present in many diverse ways and situations. Not only the poor, but generally all families face risks of suffering negative shocks that can damage their well-being. However, poor households (which are the unit of analysis in this study) are more vulnerable and less able to insure themselves against hazardous occurrences.

Among the most common risks poor household face during their lives is negative income shocks which are the unexpected and unfortunate events leading to a significant loss in income. Negative events can be: health shocks in the presence of sick family members; labor and business shocks (unemployment either of the household’s head or decrease on the proportion of unemployed working-aged household members,
or the loss of household’s business); other shocks are drought, plague, flood, crime and insecurity.

In addition, household vulnerability against unexpected events is likely to be greater among families in rural zones in poor countries. This is because social assistance is scarce, and no other publicly managed mechanism is available; and when accessible, some informal safety nets can generate distress and impose negative effects on the well-being of families (Townsend, 1994b, 1995). The implications of such mechanisms are discussed later in the section of strategies and models of informal safety nets.

The analysis of informal insurance is relevant for public policy because it can lead families into a worse situation under poverty, specifically if it is costly (i.e. high interest rates paid to money lenders, selling under valued assets, etc.). Therefore, public intervention is essential to reduce these risks and help poor households maintain their level of consumption. Interventions take place by providing efficient institutional frameworks for social assistance and improving access to cost effective insurance mechanisms (see Townsend 1995; Morduch 1999; Morduch & Sharma 2002; Jensen, 2002; Barrera & Perez-Calle 2004).

Nevertheless, the relationship between poverty vulnerability and consumption smoothing entails more analysis to examine how the poor manage their risks in the absence of public intervention, and how public intervention functions within informal practices of insurance currently taking place in poor localities.

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3 Informal insurance is referred to different social arrangements poor household carry out to insure their consumption (i.e. traditional moneylenders and pawnshops).
1.3 Access to insurance: strategies and models of informal social safety nets

The presence of poverty vulnerability has led the poor to develop different informal models for risk diversification and planning. Thus, either publicly managed social assistance or informal safety nets provide poor households the necessary means to insure their level of consumption against hazardous occurrences. Such strategies and mechanisms are further described to emphasize their relevance for consumption smoothing.

First, credit, saving, and lending strategies do help to smooth consumption against negative income shocks. In recent development practice, microfinance mechanisms have led the processes of social insurance not only for poor households but for all who are traditionally excluded from formal financial system. Microfinance’s most well-known mechanism based on group lending, dynamic incentives, regular payment schedules, and collateral substitutes, has helped the poor to build stronger informal safety nets (Morduch, 1999a).

Second, households living in rural communities often count on grain storages to insure against the loss of crops. These mechanisms were created to respond to the lack of formal insurance against the great uncertainty on harvest\(^4\). Such uncertainty makes agricultural workers not only to plan according to the expectations on the rainy season

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\(^4\) Uncertainty on harvest is present due to unexpected event such as hurricanes, floods, plagues, or droughts.
and on their level of investment on fertilizers, but to seek different sources of informal insurance (Townsend, 1994b; Morduch & Sharma, 2002).

Third, migration is another strategy to mitigate negative shocks in income; some family members may migrate to increase the household’s income and thus reduce their vulnerability against unexpected events. That is, migration takes place before a negative shock takes place. It is also known that migration of one or more family members occurs once poor household are hit by severe and unexpected income shocks. In either way, remittances play a major role in pooling household income to prevent any decrease in consumption level (Rosenzweig & Stark, 1989; Jensen, 2002).

Generally, there is evidence on how microfinance, crop storage, and migration among many other strategies contribute to smooth consumption. However, these informal insurance mechanisms vary according to different levels of income. To insure consumption against potential risks, more risk averse families would engage in less risky economic activities, reducing their vulnerability to negative shocks. As the analysis of Morduch and Sharma (2002) describe: “if the lack of consumption smoothing mechanisms force households to smooth income, there will be less risk that is actually present and common indicators of risk will understate inherent variability”.

Consequently, different risk can be managed by distinct means. Consumption vulnerability to income fluctuations leads the risk-sharing model, which allows the poor to engage in informal arrangements to cope mainly with income volatility and lessen its

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5 Remittance refers to money sent from one place or person to another; remittance economy is one dependent on such money transfers, often from a family member abroad to relatives back home.
expected impacts on consumption. The model is simple: two agents or families (A & B) engage informally to help each other once negative income shocks are present; (A first assists B by expecting it will respond once A requires financial assistance).

However, the functioning of this model depends on the types of risk poor people confront. Covariate risk are the risks everyone face at the same time (i.e. bad rainy season for agriculture), and limits the model because of general and simultaneous demand for compensatory finance. Under anticipated risk (i.e. the birth of new child, the end of job contract), households are in better position to plan, and these risks cannot be managed by risk-sharing. Lastly, the model is not feasible for permanent risks (i.e. health diseases) since households need long-term borrowing, and reciprocity does not occur (Jacoby & Skoufias, 1997; Morduch & Sharma, 2002).

Risk-sharing for consumption smoothing among the poor is likely to function for idiosyncratic and non-anticipated risks. The model would work as long as the downturn in income of one household does not coincide with a downturn in incomes faced by other household, and as it requires peer monitoring, selection of partnership, it helps reduce attempts to default on this engagement by participants in the model (Besley, 1995).

In addition, one of the main reasons why poor households seek for group insurance is to lower transaction cost on traditional financial markets from what are also excluded. The allocation of risk among different participants in lending group strategies allows cheap and cost effective insurance. Group lending moves households out of
long-established relations with moneylenders and pawnshops who traditionally diminish the capacity of individuals and households to enter into a more prosperous dynamic of economic development (Barrera & Perez-Calle 2002; Morduch, 1994, 1995, 1999, 1999a; Subbarao et. al., 1997).

Finally, the success of informal arrangements depends on whether families are in transitory or chronic poverty. Transitory poverty means families are temporarily poor by a negative shock; transitory poverty sets the conditions for informal insurance like group lending strategies. Chronic poverty refers to families who are permanently poor and this condition cannot be overcome by participating in informal social arrangements. Therefore, families in chronic poverty would be in the need of different mechanisms of consumption smoothing such as direct public assistance.

1.4 Public intervention

The main question in the literature is how the state can intervene to provide efficient mechanisms of insurance against poverty vulnerability. Insuring consumption through social policies has traditionally been the main objective of governments of developing countries since it reduces hazardous effects; however, the threat of crowding out pre-existing informal safety nets by the introduction of publicly managed mechanisms is persistent (Smith & Subbarao, 2003).

Because there are informal safety nets that can harm the well-being of poor households, public intervention is done for several reasons: (1) displace informal
mechanisms affecting poor households (i.e. child labor); (2) create a regulatory and institutional framework to scale-up services through informal safety nets, and reduce government incapacity of response at state and local level; and (3), make sure a minimum of insurance is received due to under-provision of safety nets services in poor areas (Cox & Jimenez, 1992; Jensen, 2002, Morduch, 1999).

The following examples illustrate some of the effects of public intervention. In South Africa, Robert Jensen (2002) compares the difference in the level of remittances received by pensioners and non-pensioners workers, after the increase in pension levels, relatively to the difference before the increase; the findings of crowding-out effect differ across both groups. In Colombia and Nicaragua, public cash transfer programs and other public interventions have not displaced informal mechanisms from a scheme of risk-sharing mechanism (Barrera & Perez-Calle, 2002); the evidence, however, is not clear for Northern Thai villages, where the effects of public intervention vary across distinct private transfers and informal mechanisms (Townsend, 1995a). Finally, in the case of Mexico, García-Verdú (2002) analyzes a model of informal insurance (risk-sharing model) and also finds there is no crowding-out effect between cash transfers and informal safety nets.

1.5 Consumption smoothing

Different econometric models have been developed to estimate the interaction between economic vulnerability and protection. The models state consumption is
attached to several idiosyncratic shocks, and its variability among vulnerable groups reflects an imperfect consumption smoothing (Cochrane, 1991; Mace, 1991; Morduch, 1991).

Consumption smoothing may vary among durable and non-durable goods; food consumption tends to be more responsive to income shocks than to large idiosyncratic shocks because risk averse households would share the risks they face (Townsend, 1994b, 1995a; Allem & Townsend, 2004). The evidence of consumption smoothing in Latin America indicates that household consumption in Nicaragua is more responsive to crop shock while in Colombia it is more responsive to health shocks; consumption in Colombia responds more to negative shocks than to positive shocks in income; in Nicaragua, consumption responds symmetrically to income shocks (Barrera & Perez-Calle, 2002). In addition, risk-sharing in rural Mexico demonstrates how household consumption commoves with aggregate consumption and less with idiosyncratic shocks (García-Verdú, 2002).

To examine the effects of income fluctuations on consumption, as well as the impacts of hazardous events on overall spending, it is necessary to analyze how poor households reduce their vulnerability to idiosyncratic and non-anticipated risks. The permanent income hypothesis (PIH) refers to how household consumption is determined by its long-term permanent income. According to the PIH hypothesis, individuals tend to smooth consumption when facing temporary income fluctuations (Barrera & Perez-Calle, 2004).
The literature considers how idiosyncratic shocks have influenced the variation on income and analyzes the responses of households to such negative impacts. However, despite the presence of poverty vulnerability and its threats to consumption are similar across poor countries, responses to income fluctuation and other negative shocks vary from country to country.

The study of consumption smoothing provides information on the relationship between risk and poverty. The permanent income hypothesis predicts that consumption would respond only to permanent shocks of income, but would remain stable in the face of transitory shocks. According to the hypothesis, individuals or households tend to smooth consumption when facing temporary income fluctuations (Barrera & Perez-Calle, 2002).

Despite the growing research on the relation between consumption smoothing and income vulnerability, special attention should be put on how informal safety nets and publicly managed programs might complement each other.

In addition, in order to design better social policies, the research has to analyze the extent to which public intervention displaces informal safety nets (whether they are efficient or not).
II. DATA

This research uses panel data from the cash transfer program “Progresa” in Mexico\textsuperscript{6}. The data consist of repeated observations on households in 506 localities, with information from November 1997, and then every 6 months until November 2000. Localities were randomly assigned to treatment and control groups (320 and 186 respectively), and the baseline survey was collected in October of 1997 where 24,000 households in 506 localities in 7 states were interviewed.

The following rounds of the panel were collected in March and November of 1998, April and October/November of 1999, and May and November of 2000. It is important to clarify that as the program was expanded into different states through eleven phases, more localities were assigned to treatment and control groups, following the same selection process described in the Appendix A.

In addition, some families located in the initial control localities were added to the program as this was the condition offered by the program in order to have a control group. However, this was not done until the rounds of May and November of 2000. This characteristic of the program makes it difficult to analyze consumption smoothing for specific families across all the panel rounds. For example, if a family was initially in control group at the beginning of the program and later it became part of treatment, the evaluation of consumption smoothing mechanism fails.

\textsuperscript{6} García-Verdú (2002) analyses the model of risk-sharing in rural Mexico. His work is one of the few studies about consumption insurance in Mexico using the information of Progresa.
Because it is the purpose of this research to find whether or not Progresa makes it easier to smooth consumption, the research considers the third (October/November 1998) and fifth wave (October/November 1999) to compare consumption smoothing across the two groups.

In order to test consumption smoothing, and the likelihood of crowding-out effects of Progresa, a panel is constructed which provides crucial information on consumption, income, household size, informal safety nets, health and environmental shocks, and finally private transfers.

2.1 Variables

In the panel, the variables are consumption, income, and private transfers. The remaining variables are defined as dummy variables to capture treatment, household size and idiosyncratic shocks (health or environmental).

Food consumption or consumption of non-durable goods is constructed using the specific information on how much expenditure in food is done in a typical week before the survey was done. These expenditures include four categories: vegetables and fruits; cereals and grains; products of meat, fish and poultry; and, other industrial products such as coffee, alcohol, sugar, vegetable oil, and candies.

Income comes from different sources that can be split into two categories: labor income and other sources of income. For the first type, families report the total earnings

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7 This section is more detailed in the Appendix C.
from working members older than eight years old; additionally, families report any other earnings coming from another job. For the second type, families report earnings from private gains (retirement pensions, capital gains, rents from land or machinery), and from eight other sources (other economic activities such as sewing, construction or carpentry, handcrafting commercialization, etc.)

It is worth mentioning that income in this research does not consider earnings coming from agriculture or harvest. This is because the second wave, October 1999, does not provide information on the amount of earnings received from those activities. Finally, all other sources of income

Household size is measured as the number of individuals living in the household. Besides, four dummy variables are created to examine consumption smoothing across different cohorts of family size.

Health shocks is defined as a dummy variable that reports whether or not a family member got sick during the previous month before the survey was collected. For environmental shocks, families report whether they were hit and suffered from the presence of droughts, plagues, fires, frosts, floods, hurricanes, and earthquakes.

Finally, to measure private transfers, I have considered the sum of money families have received from relatives not living in household for at least 5 years. This includes relatives living in the same locality or state as well as relatives living abroad. If private transfers considered the sum of money sent by relatives living abroad, they could be the amount of remittances these families receive.
III. METHODOLOGY

The paper follows the standard full consumption insurance test based on previous research by Townsend (1994b), Mace (1991) and Cochrane (1991). Using panel data, I am able to construct the percentage change of household consumption and income and also use various measures of idiosyncratic shocks to test whether or not household consumption fluctuates with these shocks.

In addition, I am able to evaluate whether Progresa reduces (crowds-out) private transfers received by those families in the panel. The Appendix B of this research document includes a section in which I provide full detail on how the panel was constructed.

3.1 Consumption smoothing

The main model follows a two period panel. The basic specification regresses the percentage change of consumption on the percentage change of income, household size, and different measures of idiosyncratic shocks (health and environment). The presence of Progresa is also included in the analysis as a dummy variable to identify the treatment effect.

Generic Model:

\[ \Delta C_{i,t} = \beta_0 + \beta_1 \Delta Inc_{i,t} + \beta_2 T + \beta_3 A + \beta_4 X + u_{i,t} \]

Where:
\( \Delta C_{i,t} \) \hspace{1cm} \text{percentage change in consumption from 1998 to 1999}  \\
\( \Delta \text{Inc}_{i,t} \) \hspace{1cm} \text{percentage change in income from 1998 to 1999}  \\
T \hspace{1cm} \text{is a dummy variable (T=1 participation on the program “Progresa”) }  \\
A \hspace{1cm} \text{is a vector of different measures of household size in 1999}  \\
X \hspace{1cm} \text{is a vector of idiosyncratic shocks (Dummies for Health and environment) in 1999} \\

The percentage change of consumption and income is determined by:

\[
\Delta C_{i,t} = \ln \left( \frac{\text{consumption}_{i,1999}}{\text{consumption}_{i,1998}} \right) = \left( \ln c_{i,t} - \ln c_{i,t-1} \right)
\]

\[
\Delta \text{Inc}_{i,t} = \ln \left( \frac{\text{Income}_{i,1999}}{\text{Income}_{i,1998}} \right) = \left( \ln \text{Inc}_{i,t} - \ln \text{Inc}_{i,t-1} \right)
\]

The effect of the percentage change of income on consumption is expected to be statistically significantly different from zero. In addition, once household characteristics and other idiosyncratic shocks are partialled out, this relationship is expected to be consistent. The assumption is for income and consumption to commove and that sudden drops in income imply a decrease in consumption. Therefore, I expect a statistically significant effect in the percentage change of income (H1: \( \beta_1 \neq 0 \)).

Previous studies have shown that the coefficient of income is positive but its effects on consumption are quite small. There are some possible explanations for this empirical finding. On one hand, I argue this can be the result of how income is measured. If informal income is not reported, the effects of income changes on consumption can be underestimated. On another hand, I consider that income for poor families is already very low that consumption may not responsive to its negative fluctuations.
The presence of the program “Progresa” on consumption smoothing is expected to be statistically significant different than zero ($H_1: \beta_2 \neq 0$). If the null hypothesis is rejected, this means that treated families would have an additional source of income which would allow them to smooth consumption more than non-participating families. Thus, it is believed that when similar families face similar shocks, some will smooth consumption in greater scale (Treatment families). Nevertheless, this analysis may vary if we consider that the amount of Progresa’s cash transfers varies according to the number of children in the household that qualify for the program. This means that within treated families, consumption smoothing may differ.

The study of the Mexican case by García-Verdú (2002) shows that household consumption is more responsive to aggregate consumption than it is to idiosyncratic shocks. Given the previous specification, I expect similar findings also in terms of health and environment shocks; when they occur, they might affect household’s income and further impose difficulties for families to maintain consumption. Therefore, I expected to find statistically significant evidence on the effects of health and environment on the percentage change of consumption from 1998 to 1999.

It is interesting to note that within the environmental shocks some may affect consumption to a greater degree. Because families in this study live in rural localities, the effects of droughts, plagues, floods and frost are more likely to happen and their effects on consumption may differ among themselves.
Finally, in order to test the marginal effect “Progresa” has on consumption smoothing, a new specification is carried out.

$$\Delta C_{i,t} = \beta_0 + \beta_1 \Delta \text{Inc}_{i,t} + \beta_2 T + \beta_3 \Delta \text{Inc}_{i,t} \ast T + \beta_4 A + \beta_5 X + u_{i,t}$$

Where:

$$\Delta \text{Inc}_{i,t} \ast T \quad \text{Percentage change of income} \ast \text{Treatment}$$

The interaction term between the percentage change in income and the treatment effect of Progresa is expected to be negative; a simple t-test is needed to observe statistically significance ($H_1: \beta_3 < 0$)\(^8\). The reasoning is that as long as families face drops in income, consumption is to decrease, but the presence of the program may help to hold consumption. Therefore, a negative relation is expected.

3.2 Crowding-Out Effect

When generating the variable income for this panel, I do not include the amount of private transfers household receive. This is done in order to separately test if the presence of the program has crowded-out the presence of informal private transfers.

Generic Model:

$$\Delta \text{Transfers}_{i,t} = \beta_0 + \beta_1 \Delta \text{Inc}_{i,t} + \beta_2 T + \beta_3 A + \beta_4 X + u_{i,t}$$

\(^8\) See Appendix D for the statistical test.
Where:

\( \Delta \text{Transfers}_{i,t} \) percentage change in private transfers from 1988 to 1999

\( \Delta \text{Inc}_{i,t} \) percentage change in income from 1998 to 1999

\( T \) is a dummy variables (T=1 participation on the program Progresa)

\( A \) is household size in 1999 (squared)

\( X \) is a vector of idiosyncratic shocks (Dummies for Health, environment) in 1999

If the coefficient \( \beta_2 \) is not statistically significant, this would mean that the presence of the program does not have any effect on the change of transfers received by families. In other words, this would imply that the percentage change of private transfers from 1998 to 1999 is not different for treated and non-treated families, and that there is no crowding-out effect made by Progresa.
IV. Results

4.1 Consumption Smoothing

As mentioned earlier, I analyze whether Progresa functions as a consumption smoothing mechanism and whether it has reduced (crowded-out) private transfers. The first three tables illustrate the results of thirteen different panel estimations providing statistical evidence that consumption commoves with income.

As expected, there is a significant relationship between the percentage change in income and the variation of the percentage change in consumption within this period of analysis. Nevertheless, the impact of the percent change in income on the percentage change of consumption is small.

According to the results, other things constant, a one percent change in income is associated with at 0.0208 to 0.0268 percent change in consumption. The estimates in this paper show consumption to be responsive to income, but not by a large amount. This finding is consistent with García-Verdú (2002) who finds that consumption is more responsive to other factors such as aggregate consumption and idiosyncratic shocks.

This statistical evidence suggests that the variation of total expenditures of non-durable goods by poor families might be more responsive to other factors than the percentage change in income. Tables 1a, 1b, and 1c illustrate that there is consistency on the estimations of consumption smoothing. Whether household size and other idiosyncratic shocks are held constant, the impact of one percentage change in income
will make the percentage change in consumption to vary from 0.0208 to 0.0268 percent change in consumption.

Table 1a. Consumption smoothing

<table>
<thead>
<tr>
<th>Y=lncon98_99</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.0470***</td>
<td>-.0102</td>
<td>-.1530***</td>
<td>-.0179</td>
<td>-.0910***</td>
<td>.0109</td>
</tr>
<tr>
<td>Ln Income Change 98_99</td>
<td>.0220***</td>
<td>.0222***</td>
<td>.0210***</td>
<td>.0211***</td>
<td>.0209***</td>
<td>.0212***</td>
</tr>
<tr>
<td>Treatment</td>
<td>.0025</td>
<td>.0025</td>
<td>.0025</td>
<td>.0025</td>
<td>.0025</td>
<td>.0025</td>
</tr>
<tr>
<td>Household Size 1999</td>
<td>.0166</td>
<td>.0166</td>
<td>.0166</td>
<td>.0166</td>
<td>.0166</td>
<td>.0166</td>
</tr>
<tr>
<td>Household Size (sq) 1999</td>
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<td>.0235***</td>
<td>-.0236*</td>
<td>.0236*</td>
<td>.0236*</td>
<td>.0236*</td>
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<tr>
<td>Family Members</td>
<td></td>
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<td></td>
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<tr>
<td>Less than 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.0654***</td>
<td>.0165</td>
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<td>Between 11 and 15</td>
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<td>.2084***</td>
<td>.0439</td>
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<td>More than 15</td>
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Observations: 10,661
Standard Errors are reported below parameters
* Statistically Significant at 10%
** Statistically Significant at 5%
***Statistically Significant at 1%
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<tr>
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<th>Model 8</th>
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<th>Model 10</th>
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<td>- .0695***</td>
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<tr>
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Observations: 10,661

Standard Errors are reported below parameters

* Statistically Significant at 10%
** Statistically Significant at 5%
*** Statistically Significant at 1%
Table 1c. Consumption smoothing

<table>
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<tr>
<td>Households Size (sq) 1999</td>
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<td>.0019***</td>
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<td></td>
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<td>.0002</td>
</tr>
<tr>
<td>Health shock</td>
<td>- .0691***</td>
<td>0.227</td>
</tr>
</tbody>
</table>

Type of Environmental Shock

|                      |            |            |
| Droughts             | .0730**    | .0702***   |
|                      | .0314      | .0314      |
| Floods               | -.0990**   | -.0967***  |
|                      | .0306      | .0306      |
| Frozen               | -.0257     | -.0260     |
|                      | .0256      | .0256      |
| Fire                 | .0549      | .0433      |
|                      | .2320      | .2320      |
| Plagues              | .0195      | .0215      |
|                      | .0581      | .0581      |
| Earthquakes          | -.0459     | -.0440     |
|                      | .0558      | .0558      |
| Hurricanes           | -.1338***  | -.1340***  |
|                      | .0317      | .0317      |

Observations: 10,661
Standard Errors are reported below parameters
* Statistically Significant at 10%
** Statistically Significant at 5%
*** Statistically Significant at 1%

In order to evaluate the contribution of Progresa to consumption smoothing, households are separated into two groups (treatment and control) by a dummy variable: Treatment. In this panel, 62 percent of the families are part of Progresa (6,616 families out of 10,661).
At this point it is important to note, that there is no statistically significant difference between the mean of consumption of non-durable goods for both groups in both years.\textsuperscript{9} In addition, the mean of the percentage change of consumption from 1998 to 1999 is not different for both groups (see Appendix D).

Nevertheless, Models 2 to 13 present evidence that consumption smoothing differs across both groups. It is interesting to examine that holding other factors constant, families in the program smooth consumption more than families in the control group. This means that participating in the program is associated with at least 9.15 percent change in consumption.

That there is no statistical significant difference in the means of consumption between these groups raises the question why when controlling for income, the treatment group is more able to smooth consumption than the control group; is it because Progresa’s transfers are not counted in income?

An approximation to this answer is that there is statistically significant evidence to demonstrate that the mean of income across both groups differs\textsuperscript{10}, and despite the fact that Progresa is not an insurance program, it does helps treated families to have an additional source of income that facilitates them consumption smoothing. However, as

\textsuperscript{9} At 99.99\% confidence level, the results of a t-test of difference of means illustrate that there is no statistically significant evidence that the mean of consumption differs across groups. See Appendix D for more detail on this and other statistical tests.

\textsuperscript{10}See Appendix D.
explained before, the effects can vary within treated families due to the differences in the sum of cash transfers received by Progresa.

What is more, in order to test the additional marginal effect “Progresa” has on consumption smoothing, Model 11 (Table 1b) includes the interaction between the percentage change in income and the participation of the program. As expected, holding other things constant, the interaction term is negative, but statistically significant at 10% confidence level. The fact that the estimated $\beta_3$ is statistically significant different from zero represents that the percentage change in consumption is not the same for treated and controlled families, even when we control for income.\footnote{In this Model 11, a statistically significant estimator for $\beta_3$ means that the slope of the percentage change in consumption with respect to the percentage change in income is not the same for treated and non-treated families.}

Models 3 to 13 illustrate the variation of the percentage change in consumption once I control for household size. In the Table 1a, models 3 to 6 present different measures of household size.

Model 3 implies that, other things constant, one additional member in the family is associated with a 2.35 percent change increase in household consumption of food. Model 4 also includes the square of household size in 1999. In this model, it is interesting to see that holding other things constants, an additional member in a typical family is associated with a 1.66 percent change decrease in consumption.

Model 5, which only includes the square of household size in 1999, shows that consumption is not sensitive to changes in household size. Finally, Model 6 presents
three dummy variables for household size; the comparison group is families that have between 6 and 10 members.

Compared to this category, being a family with less than 6 members is associated with a decrease in consumption of 6.54 percent. On the contrary, being in a family that has between 11 and 15 members or a family that has more than 15 members is associated with an increase in consumption of 20.84 and 35.47 percent, respectively.

For practical terms, models 8 to 13 keep the variable of household size square in 1999. In these following models, I analyze the effects of idiosyncratic shocks on the percentage change in consumption. In model 7, suffering any type of environmental shock is associated with a 6.67 percent change decrease in consumption.

Once I control for household size and health shocks, the impact of receiving any kind of environmental shock is associated with a decrease in consumption of almost 7 percent. This finding is consistent with our expectations. Evidence from Nicaragua and Colombia shows that consumption is also responsive to idiosyncratic shocks, and in the case of Mexico, consumption commoves more with these types of shocks than with fluctuations in income.

For a typical family in this analysis, having a health shock imposes a greater impact on the percentage change in consumption than any environmental shock. As seen in Models 10, 11, and 13 (tables 1b and 1c), suffering from a health shock is associated with a decrease in consumption of at least 6.91 percent.
Models 12 and 13 include 7 types of environmental shocks which are compared to those families having reported not suffering any shock of this sort. As it is shown in Table 1c, the effects of different environmental shocks vary. Some types of environmental shocks are associated with increases in food consumption while other are associated with decreases.

For those environmental events that impose a decrease in consumption, it means that household resources were used for other means but consumption. On the contrary, for those shocks that according to the estimations impose a positive change in consumption, it means household resources were allocated to increase consumption when the shock was suffered.

Despite the direction of the effects, not every environmental shock is statistically significant. Other things constant, suffering from droughts is associated with a 7.30 percent change increase in consumption. On the contrary, suffering from floods is associated with a 9.9 percent decrease in consumption. For families that experienced hurricanes, they suffered a decreased of 13.35 percent change in consumption.

Overall, consumption is quite responsive to income fluctuations; however, the percent change in consumption does not move by a large amount for a percent change in income. In addition, consumption is largely responsive to the participation in the program. Thus, Progresa families smooth consumption more than non-participating families.
4.2 Crowding-out effect

Using the same panel, I analyze the possibility of crowding-out effects of Progresa. In both surveys, 1998 and 1999, families are asked to report if they have received support (monetary) from a family member living out of household for the past five years and who had not come back to live with them during this time.

Table 2. Crowding-out effect

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
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<td><strong>Constant</strong></td>
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<td>4.8029***</td>
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<td></td>
<td>.2458</td>
<td>.3194</td>
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<td>.0385</td>
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<td></td>
<td>-.0129</td>
<td>.0006</td>
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<td></td>
<td>.3139</td>
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<td>.3128</td>
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<tr>
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<td>- .5308</td>
<td>.3423</td>
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<tr>
<td></td>
<td>.3423</td>
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<tr>
<td>Health Shock</td>
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<td>.4543</td>
<td>.4531</td>
</tr>
</tbody>
</table>

Observations: 468
Standard Errors are reported below parameters
* Statistically Significant at 10%
** Statistically Significant at 5%
*** Statistically Significant at 1%

To carry this analysis, I consider only those families that report having received private transfers; thus, the number of observations drops to only 468 cases.

The table above clearly illustrates that Progresa has not crowded out the amount of monetary help received. Either if other factors are not held constant (model 1) or if other variables are partialled out (model 4), treatment is not statistically significant. It is important to note that in models 3 and 4, the percentage change in income presents a
negative relation with the percentage change in remittances. This means that a one percent change in income is associated with a decrease in private transfers by almost one percent. In comparison to model 2, if the percentage change in income is not held constant, household size is not relevant for the amount of remittances received. This means that once the percentage change in income is partialled out, household size (in model 4) influences the percentage change in income. Nevertheless, the size of the effect is small.

Another interesting result is that the percentage change of remittances does not respond to health shocks (models 2 and 4). It could be assume that once a family receives a health shock, the amount of private transfer would be increased. This analysis can be applied for environmental shocks. Suffering or not the effects of any type of environmental shock does not impose an impact on the percentage change of consumption.
V. Policy Implications

I have examined how poor families respond to idiosyncratic shocks which harm their well being (measured in terms of consumption of non-durable goods), and I have studied whether or not Progresa displaces traditional safety nets as remittances.

In this research I have demonstrated that Progresa does help its participating families to smooth consumption more than non-participating families, and that the amount of remittances does not vary between groups.

There are at least two policy implications regarding the findings in the previous section. First and most important, is that Progresa can be expanded to other localities and regions of rural Mexico. Despite the fact that Progresa was not designed to be an insurance program, according to my estimations, Progresa helps its families to smooth consumption.

Second, as Progresa is expanded to other rural communities, there is little threat it will displace informal safety nets as remittances. On the contrary, these types of social programs have helped its beneficiaries to have an additional source of income that would help them insure consumption against negative income fluctuations and idiosyncratic shocks.
VI. CAVEATS AND LIMITATIONS

This research does not evaluate the contribution to consumption smoothing of other publicly managed safety nets in which Progresa and non-Progresa families participate such as: scholarship of the program “Solidaridad”, support from the National Indigenous Institute, training support, temporary employment, and Procampo (a subsidy program for agriculture). In addition, my analysis does not control for the fact that treated and control families of Progresa may participate in other social programs.

The study does not examine the possibility of a crowding out effect between Progresa and other social programs; thus, it is important to continue the research on this perspective to understand if Progresa complements other social programs or if there is a displacement effect among them.

An extension of this research is to analyze the effects of other sources of income. This is the case of non-private income which is reported as monetary support received from other social programs (Solidaridad, training support, Procampo, etc.). In the analysis I find that the percentage change in consumption does not vary greatly with the percentage change in income, therefore, different regression would be required to consider non-private income (or other publicly managed transfers).

Moreover, the analysis in this research does not control for the amount of cash transfers a typical family receives from Progresa. The program provides transfers according to the number of children that qualify to the program (i.e. households that
have more female kids are more likely to receive larger amounts of transfers since the
program was also designed to increase the participation of females in school).

The results in this analysis imply that there is a need to study the role of other
informal safety nets (different than remittances) and to examine how they might
contribute to consumption smoothing. By doing this analysis, new policies can be
designed to introduce such informal mechanisms and to expand them to other contexts.
For example, because pawn shops or money lenders, if available, have traditionally
helped the poor to smooth consumption, microfinance emerged as strategy from the
state to expand its benefits to families that do not have access to such mechanisms.

Nevertheless, because Progresa is not an insurance program, its evaluation
surveys (since 1997 to 1999) did not include any information regarding loans, credits or
savings. Therefore, it is complicated to carry on the evaluation of financial instruments
on consumption smoothing for these families within these years.

It is important to clarify that the second analysis in this research (crowding-out
effect) takes into account the amount of private transfers received by treatment and
control families. This means I only consider the amounts of money transferred to the
family by all relatives living outside the household (either in same locality, other
locality, other state, or other country). If there is an interest to evaluate a crowding-out
effect between Progresa and remittances, then the analysis should consider only those
transfers made by relatives living abroad.
Consumption smoothing in this analysis can be expanded if we consider household consumption of durable goods. In addition, the panel in this research does not take into account the depletion of assets both types of families could have carried on to smooth consumption.

Finally, despite these panels’ use of household as the unit base, the information may vary if we transform consumption according to adult equivalents. This means that children and adults in a household may not receive the same treatment and thus a household with more children has a different pattern of consumption than the one with fewer children.
VII. Conclusion

I began this research by stating that low income families around the world are vulnerable to catastrophic and unfortunate events that lead to significant income losses. As it was demonstrated, consumption is positively responsive to changes in income and negatively related to suffering health or environmental shocks.

First, I analyze the relationship between the percentage change in consumption and the percentage change in income for the period of October 1998 to October 1999. One of the most important findings in this research is that the percentage change in consumption is responsive to the percentage change in income. This relationship is also consistent when holding constant other factors that may influence household consumption such as environmental and health shocks.

Additionally, there is a statistically significant difference on consumption smoothing for treated families, and again, when controlling for other factors, the evidence is consistent.

Finally, I find no evidence that Progresa has not crowded-out the amount of remittances received by families within both groups. The analysis in this research document implies that Progresa, despite of not being a consumption insurance program, helps treated families to smooth consumption. Therefore, the evidence suggests that the program could be expanded to other poor families to reduce their vulnerability against negative income fluctuations, and other idiosyncratic shocks they may suffer.
Moreover, this type of public intervention does not harm traditional informal safety nets as private transfers.
APPENDIX A

In Mexico, since 1997, poor families in specific rural localities were eligible to participate in the program “Progresa”. The social program offers cash transfers to poor mothers in marginal rural communities, conditional on their children using health facilities on a regular basis and attending school between third grade of primary and third grade of secondary. The amount of cash transfer for treated families may vary according to the number of children that live in the household, and also depends on the number of female kid who receive a larger sum of money since it is the program objective to increase female participation in schooling.

Initially, in 1997, Progresa collected a panel data from 24,000 households from 506 localities in seven states of Mexico. The localities were randomly assigned to be treatment and control (320 and 186, respectively) using probabilities proportional to size (4,546 localities for treatment, and 1,850 for control).

Communities were first selected using a marginality index based on census data; then households were chosen using socioeconomic information (baseline) collected for all households in the communities; finally, the list of potential beneficiaries was presented to the community assemblies who selected the final beneficiaries.

Some other clarifications of Progresa are: (1) it is not an insurance program; if treated families suffered an income shock, they receive the same amount of cash transfer. Its purpose is to complement household income to increase the level of education and health of children. (2) The survey questionnaires are not specifically
designed to measure risk or insurance. (3) The sample is representative of treatment localities in seven states where the program began as a pilot experiment. (4) As the program was expanded to other regions, more families were added into both groups. Families that were initially in control group began to receive cash transfers, but this was until the year 2000. (5) Additionally, as the program covered other regions, the benefits of the program have also been expanded to older children who are in middle school.

Finally, Progresa is currently known as “Oportunidades”, the new name was given by the current administration of President Vicente Fox (2000-2006).
In this section I provide detail on the two samples I used for the panel. For the first analysis (consumption smoothing), I use the survey of October/November of 1998. While the household survey initially has 25,591 observations, the individual survey has 138,285 observations. It is important to mention that the household survey provides information on the families classified as poor (pobre_1), and it identifies which family is in the program or not (contbas2). When I merge both data sets, there are 11,808 observations.

The survey of October/November of 1999 has two data sets for household and one for individuals. However, for the first panel data, only one household survey is used. This is because the second data set of household survey includes the information on remittances, which is then used for the second panel. When I merge both data sets (individual and household 1999), there are 23,267 observations.

In order to construct panel 1, I merge both years using the variable folio which identifies each household. Thus, the final observations for the panel are 10,661. It is important to note that this is the last number of observations once I have made changes on the variables of interest.

To carry out the second analysis (crowding-out effect), the dynamic is the same. From 1998, when merging household and individual data sets, the final number of observations is the same, 11,808. The difference is for the second year 1999. When merging both household data sets in 1999 there are only 7,532 observations. Remember
that these observations consider those families who had reported having a relative living outside the household for more than five years, and who has not come to live at the household again. When I merge the household survey with the individual data set, the same number of observations, 7,532, are kept.

Merging both years using the same variable folio generates a panel with 3,136 observations. However, this is not the last number of observations used for this analysis. I further drop all missing values for private transfers; therefore, the second analysis is estimated using only 468 observations.
APPENDIX C

I use this section to explain in detail the selection of variables for analysis. For consumption, Progresa’s survey includes different sections for weekly household’s expenditures that I separated into non-durable (food) and durable goods. In 1999, more categories were added to the expenditures in food, but I did not consider them in order to be consistent with the categories included in 1998.

For income, as it was explained in the section two, there are different categories that can be classified into labor and non-labor income. The survey of 1998 includes three additional categories: income from harvest, cattle, and other cattle activities produced at home. However, these are not included for total income in the panel because these categories are not considered in 1999.

The information of income coming from main job and other jobs is founded at individual level. Therefore I aggregated income at individual level to add it further with other categories of income. Non-labor income comes from two sources. First, families report if they have received private gains. These are: retirement pensions, widow pensions, rent from properties, and banking interests. In the survey of 1998, some families report having received community gains, but they are not considered in this category because it is not included in 1999.

Finally, the second source of non-labor income comes from eight different economic activities that are not reported as the main job. These are: sewing, selling
food, construction/carpentry, handcrafting, transportation, fixing domestic articles or other machinery, washing and ironing cloths, and other activities.

Information about household size is in both surveys. However, I decided to use the information about 1999. This is partly because there is no statistical difference that demonstrates that the mean of household size varies across groups and years.

Finally, the information of safety nets refers to the amount of money a typical household received by someone who is not a relative. However, because the lack of sufficient observations, it was not used in panel. Therefore, to carry out the analysis of crowding-out effect, I use private transfers.
APPENDIX D

In this section, different two-sample tests with equal variances are carried on, as well as one-tail statistical tests.

1. This note presents the statistical test to examine if there is any statistically significant difference between the mean of consumption for both groups in each year.

1998
$546.62 - $585.70 = 0$  
$t = -4.6962$  
$p-value = 0.0000$

1999
$516.91 - $616.22 = 0$  
$t = -14.7056$  
$p-value = 0.0000$

2. Statistical test for the mean of the percentage change in consumption for both groups (treatment and control), and for the period October 1998 to October 1999.

1998-1999
$0.0044558 - 0.0950387 = 0$  
$t = -5.4230$  
$p-value = 0.0000$

3. Statistical test for the differences of mean of income, and the percentage change in income for both groups (treatment and control), and for the period October 1998 to October 1999.

1998
$1001.612 - $1009.684 = 0$  
$t = -0.3409$  
$p-value = 0.7332$

1999
$1276.781 - $1332.945 = 0$  
$t = -1.9268$  
$p-value = 0.0540$

1998-1999
$0.6634841 - 0.5885222 = 0$  
$t = 1.1436$  
$p-value = 0.2528$
4. Statistical one-tail test for the interaction of Model 11 in Table 1b.

\[ \Delta C_{i,t} = \beta_0 + \beta_1 \Delta \text{Inc}_{i,t} + \beta_2 T + \beta_3 \Delta \text{Inc}_{i,t} \times T + \beta_4 A + \beta_5 X + u_{i,t} \]

Where:

\[ \Delta \text{Inc}_{i,t} \times T \] Percentage change of income \times Treatment

The interaction term between the percentage change in income and the treatment effect of Progresa is expected to be negative; a simple t-test is needed to observe statistically significance (H$_1$: $\beta_3 < 0$).

\( H_0: \beta_3 = 0 \)
\( H_1: \beta_3 < 0 \)
\[ t = 14.4899 \]
\[ p-value = 0.0000 \]
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- 1995a.”Financial Structures in Northern Thai Villages” Quarterly Journal of Economics