Title of proposed research project: **Labor responses to income shocks under credit constraints: Evidence from Bukidnon, 1984-2003**

Research network: PMMA

Date of submission: 21 August 2004

### TEAM MEMBERS

**Lead Researcher:**

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<tr>
<th>Last Name</th>
<th>First Name</th>
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<tbody>
<tr>
<td>MALAPIT</td>
<td>HAZEL JEAN</td>
</tr>
</tbody>
</table>

**Institution:** School of Economics, University of the Philippines, Diliman, Q.C. 1101

**Mailing Address:** 24 Toctocan Street, Masambong, Quezon City, Philippines 1115

**Email Addresses:** hazel_jean.malapit@up.edu.ph, hmalapit@hotmail.com, hmalapit@yahoo.com

**Telephone Numbers:** +63 917 837 7846; +632 363 2431

**Other Researchers:**

1. **Last Name:** REDOBLADO  
   **First Name:** JADE ERIC

**Institution:** Statistics Center, University of the Philippines

**Email Address:** jade_eric.redoblado@up.edu.ph, jade_redoblado@yahoo.com, jredoblado2003@yahoo.com

**Telephone Number:** +63 919 822 0679

2. **Last Name:** CABUNCAL-DOLOR  
   **First Name:** DEANNA

**Email Addresses:** dinz_dolor@hotmail.com

**Telephone Number:** +63 917 248 8165; +632 645 1367
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Malapit, H. J, Redoblado, J. E. and Dolor, D. M. C., August 2004*

The revisions made in the latest version of the proposal are summarized in the outline presented below. What follows is a detailed response (in black) of the authors to the comments received during the Dakar meeting (in blue).

1. **Analytical framework**: Switched from unitary to collective model. The key result is the inclusion of proxy measures for bargaining power as additional arguments in the labor supply equations. Following recent literature (Quisumbing and Maluccio 2003), we propose to use human capital and assets brought into the marriage as proxy measures of bargaining power.

2. **Methodological issues**
   a. On identification of credit constrained households: Because the direct question deals with production credit, we mention the need to correct for sample selection bias by using the Heckman procedure.
   b. On tests of labor variation: Suggested a third variable, share of transfers in total household income conditional on migration of a family member.

3. **Other issues**
   a. Used the terms ‘transitory’ and ‘persistent’ shocks, instead of ‘short-run’ and ‘long-run’ shocks.
   b. Elaborated on the treatment of split households.

A. **COMMENTS BY CHRIS SCOTT**

2. Query possibility and clarity of central hypothesis
   i. Participation rates are already high in low income HH due to the high marginal utility of income suggesting that many are already labor-supply constrained regardless of the incidence of shocks. Withdrawal of children from school may be a special case.

Participation rates in the wage labor market may not be high even for a low-income household if it relies primarily in farming its own land (90 percent of our sample are agricultural households, 63 percent own some land). In the event of an adverse rainfall shock, for example, the reduced farm income may induce some members of the household to obtain off-farm work (agricultural or otherwise), to be able to maintain consumption.

* The authors would like to thank the PEP Network for the opportunity to develop and strengthen the proposed research project. They are highly indebted to Mr. Chris Scott, Mr. Ignacio Francheschelli, Mr. A. S. Oyékalé, and the PMMA network members at the Dakar meeting for their insightful comments and suggestions.
Other members may have to increase work effort in the family farm as well as in the household (domestic work), to compensate for those members who are now working off farm. Children may be withdrawn from school either to obtain off-farm work themselves, or to attend to household chores if their wage-earning potential is not high.

The suggestion that many are already labor-supply constrained regardless of the incidence of shocks implies that there are simply insufficient work opportunities. If this is the case, individuals may not be able to sell their labor outside the farm even if they wanted to do so to buffer income shocks. However, this may not necessarily be the case if households are responding to idiosyncratic shocks. If the increase in market labor supply is small relative to the market, they may be easily absorbed. Thus, the labor supply constraint is more plausible when there are aggregate shocks affecting the entire locality. In this case, temporary migration may be an alternative labor supply response.

However, the frequency tables using the 84/85 data below suggest the opposite. About 53 percent of all households in rounds 2-4 report at least one member having off-farm agricultural employment. In addition, 21 percent report at least one member being employed in non-agricultural work. About 40 percent report a change in the number of household members employed in off-farm work from the last round (20% increase, 20% decrease). Overall, about 60 percent of households have at least one family member participating in any type of off-farm employment (not in table). All these seem to suggest that labor markets are quite flexible, allowing some room for households to vary labor supplied.

<table>
<thead>
<tr>
<th>No. of HH members employed in off-farm agricultural work</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>715</td>
<td>46.73</td>
</tr>
<tr>
<td>1</td>
<td>460</td>
<td>30.07</td>
</tr>
<tr>
<td>2</td>
<td>207</td>
<td>13.53</td>
</tr>
<tr>
<td>3</td>
<td>87</td>
<td>5.69</td>
</tr>
<tr>
<td>4</td>
<td>42</td>
<td>2.75</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>1.11</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>0.13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of HH members employed in non-agricultural work</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1201</td>
<td>78.50</td>
</tr>
<tr>
<td>1</td>
<td>293</td>
<td>19.15</td>
</tr>
<tr>
<td>2</td>
<td>31</td>
<td>2.03</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>0.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change in no. of HH members employed in off-farm agricultural work over last round</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change</td>
<td>913</td>
<td>59.67</td>
</tr>
<tr>
<td>Increase</td>
<td>309</td>
<td>20.20</td>
</tr>
<tr>
<td>Decrease</td>
<td>308</td>
<td>20.13</td>
</tr>
</tbody>
</table>
ii. Some HH members working off farm may be unable to vary hours of work at a given wage, i.e. they face demand constraint imposed by the employer. Need to distinguish this group from HH members who could vary off-farm work but choose not to do so.

Yes, this may be the case especially for non-agricultural employment. However, one can also increase hours of work by taking on multiple jobs. Although we may not be able to identify which individuals may or may not vary hours of work in a given employment, we can still capture the labor supply response by considering total market hours-of-work during the period.

Also, going back to the figures cited above, it appears that the labor supply response takes the form of an increase in participation of household members in the labor market, rather than an increase in hours worked by those members already working off-farm. So those members who previously do not work, or work only in the household or in the family enterprise (women and children, in particular), may now be seeking work outside.

iii. Unclear whether temporary migration of HH members (to send back remittances) is covered by the research hypothesis. Such migration is likely if shocks covary within a given rural locality (due to climactic factors or natural disasters). Furthermore, the effort of these migrants may not represent the increment to HH labor supply if they were previously working off-farm. Instead the increment may come from previously inactive HH members (very old or very young), substituting for migrants previous inputs to farm and HH production. This is likely difficult to measure.

This is an important point. Although migrant work was implicitly included in the “occupational types” mentioned in the proposal, it was not explicitly discussed. We acknowledge that the effort of the migrants may not represent increases in household labor supply. However, this concern is valid only in the short run analysis since labor supply, as measured by hours of work, will not be used in the long run analysis. Instead, share of transfers conditional on migration may be used for the long run analysis.

Unfortunately, temporary migration occurring within 4-month intervals, was not captured in the 84/85 data. Only members who have permanently left the household are noted, and even if these members send back remittances, it is not clear that the decision to migrate was a response to transitory shocks. This limitation prevents us from analyzing migration as a short run labor supply response to income shocks.

iv. The meaning of long-term shocks is unclear. This could mean shocks recorded over a long period of time, or shocks that may not last long but have long-lasting effects.
For clarity, we shall use the terms ‘transitory’ and ‘persistent’ shocks in place of ‘short-term’ and ‘long-term’ shocks. The terms “short run” and “long run” will be confined to the description of the analysis. By design, the 2003 shocks module does not capture shocks that are not persistent because of the long recall period.

3. Analytic framework: This is precisely the type of issue which demands a collective model, e.g. how are costs of shocks shared among different members of the HH?

We completely agree. We propose to investigate which members of the household perform the smoothing function by analyzing labor supply by age and gender categories. However, we acknowledge that the collective model is indeed more appropriate for this research, and so we have revised the proposal to reflect this new framework. Thus, we have included additional arguments in the labor supply function representing proxy measures of bargaining power.

Suggest two preliminary exercises relating to model choice:

i. Review evidence in the study area:
   - Is there income/consumption pooling?
   - Do different individuals in the HH contract with different parties outside the HH in land and labor markets?

ii. Review literature on HH domestic cycle to get a feel of how these HH evolve over long periods of time. When/why does splitting, merging, disintegration and disappearance occur?

The evolution of households is marked by demographic shifts occurring during marriage, divorce, death and migration. The 2003 data captures these events.

4. Data

i. Concern that 1984-85 panel data is not long enough to test hypothesis, while comparison between 1984-85 and 2003 is over too long a time period.

These concerns are noted. Despite its limitations however, we are convinced that there is value in using this data set. To date, we have not found any other data set that collects both credit and labor information for the Philippines. In fact, by exploring the strengths and weaknesses of the data, our analysis can certainly be useful in designing future surveys on this subject.

ii. Many 1984-85 households would have split, migrated or died out. No information on nature of panel, but reference made to ‘households formed since 1984-85’. Unclear whether these households are considered of the panel.
“Households formed since 1984-85” or “splits” refer to new households set up by former members of the original households. These are children in 1984-85 who have since married and established separate households. The children from original households are included in the panel (although they are now living in separate households), since they have observations in both 1984/85 AND 2003. On the other hand, their spouses and children are not included in the panel.

When analyzing household-level outcomes (e.g. share of wages in household income), splits will not be included. On the other hand, when analyzing individual-level outcomes (e.g. hours worked), children from original households are included.

5. Identification of credit-constrained (CC) households
   i. Answers to direct question on production credit is inadequate basis for classifying HH since there is no mention of consumption credit.
   ii. Question used on production credit is weak. Phrased differently, might get different answers.

Response to both (i) and (ii): We share these concerns. However, given the weaknesses of using the consumption insurance approach, or sample-splitting using arbitrary thresholds on net assets (and asset ratios), we have opted to use the direct approach as suggested by Jappelli (1990) and Quisumbing and Montillo-Burton (2002).

One can argue that in agricultural households, production credit is fungible and may be reallocated as necessary. Of those responding that they would use more production credit if it were available, 25 percent of sugar farmers, 9 percent of corn farmers, and 5 percent of rice farmers reported that they would use the additional production credit for non-production purposes (to buy food and other family expenses).

Although the focus on production credit is admittedly weak, we must note there are inherent problems in how credit constraints are defined. Why should the rejection of the permanent income hypothesis necessarily imply credit constraints? What determines which asset threshold should be used? Or even which types of assets should be included or not. Some economists suggest assets should cover at least one month worth of consumption, and anything lower implies one is credit constrained. Why not two months, or three, or six? Other studies are too many to cite, but the point is that defining the credit constraint has always been problematic. However, we think there are ways around the particular weakness we face in this data set.
iii. 26% of sample were lending out money, and no information on whether households were net borrowers or lenders. They may be CC based on researcher’s definition, but may want to borrow more to lend more money.

Below is data on net borrowing for all households in all rounds. Note that only 6 percent are net lenders. In addition, this table is based on the block on other income, disregarding production loans in the crop modules. By underestimating the amount of borrowing, it may be the case that those who are reportedly “breaking even” in this table are in fact net borrowers.

<table>
<thead>
<tr>
<th>Borrowing less lending, all households all rounds:</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net borrower</td>
<td>898</td>
<td>44.02</td>
</tr>
<tr>
<td>Net lender</td>
<td>132</td>
<td>6.47</td>
</tr>
<tr>
<td>Borrowing=Lending</td>
<td>1010</td>
<td>49.51</td>
</tr>
</tbody>
</table>

iv. It is unclear what purpose it serves to estimate a logit model to give the probability of being CC.

Since our research question does not require an analysis of what determines the probability of being credit-constrained, one could simply take the categories implied by the data as is. However, because the survey question asks only about production credit, there might be a selection bias against non-agricultural households. We propose to correct for this bias using a standard Heckman model.

The current proposal notes this concern. We apologize for this oversight in the previous draft.

6. Estimation of HH labor supply function: Literature best practice was to estimate a 2-step Heckman model with a participation equation (estimated with the whole sample including labor market participating and non-participating households) and a duration (hours) equation (estimated solely with labor market participating households).

The two-step Heckman procedure, or the Heckit, is a generalized Tobit. This approach allows for a different set of explanatory variables to predict the binary choice (labor market participation) from those which predict the continuous choice (hours worked). A standard Tobit constrains the two sets of variables to be the same, and the signs of their effects to be the same in the two estimated equations.

Thus, the choice between the Heckit and the Tobit depends on whether there is reason to believe that the participation decision depends on variables different from those determining hours of work. Based on our review of literature on farm households, we are inclined to think that the Tobit is more appropriate. Kochar’s (1999) study of hours of work responses to idiosyncratic shocks uses the Tobit procedure as well in estimating labor supply in rural India.
7. Tests of labor supply variation hypothesis

Author suggests that CC households are expected to exhibit:

i. Higher shares of labor in HH income
ii. Preference for less risky occupations

These seem rather weak tests.

On (i), how much variation is there in the share of labor income of the HH? Since units observed are self-employed farm households whose net business income is an undifferentiated return on labor, land, capital, and entrepreneurship, it may not be easy to identify labor income as opposed to off-farm wage earnings. Once identified it may be difficult to control for the range of other factors which determine such variation.

We must clarify that we refer to wage labor income share. Indeed, the farm household earns an undifferentiated return on farming and other family businesses, which the household members share as profits. The research hypothesis is that labor will be allocated away from family enterprises and into the labor market, as a response to income shocks. The research will investigate shares of wage labor income from all types of off-farm employment.

We regret that we cannot readily compute for share of labor income of the household at this time. Instead, we obtained the share of wages to household consumption using 84/85 data. Observations here refer to individuals. Note that some households may have more than one member contributing labor income, so the shares may be underestimated for some households. Still, there appears to be a lot of variation in the contribution of labor income to household consumption.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>pcttoexp</td>
<td>1880</td>
<td>94.33298</td>
<td>16.68507</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

On (ii), if there is higher incidence of agricultural laborers in CC households this may not be the result of this occupation being less risky than self-employment (much of the South Asian literature suggests the opposite!). Rather, it may be that (casual) agricultural work is easy to enter and exit, which is an important feature of temporary wage employment sought to buffer income shocks.

This point will certainly be considered in the interpretation of results. The statement that agricultural wage labor is less risky than farming one’s own land was based on the fact that the returns to the former is fixed regardless of the outcome of the harvest, whereas farm profits exhibit a lot of variability. For clarity, we have rephrased this in the proposal to avoid the term ‘risky’. Still, this explanation (ease of entry and exit) is consistent with the research hypothesis, i.e.
credit-constrained households may exhibit higher incidence of agricultural laborers to buffer income shocks.

8. Lack of information on research plan

The proposal lacks information on what precisely the PEP funds will be used for. There is also no research timetable with dates for outputs.

Budget Estimate

Below is a budget estimate for the research project (Total grant of PHP 840,000 assuming an exchange rate of CAN$1:42 PHP):

<table>
<thead>
<tr>
<th>Honoraria (3 researchers)</th>
<th>620,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating expenses</td>
<td>200,000</td>
</tr>
<tr>
<td>Books/Reference materials</td>
<td>20,000</td>
</tr>
</tbody>
</table>

All items are estimated for a period of 12 months. Operating expenses include office space, office supplies & equipment, internet, telecommunications, transportation, and other related utilities.

Research Timeline

Below is a Gantt chart of the timing of activities for the project. The estimated delivery dates of outputs (papers and policy briefs) will be on the 5th and 11th months of the project.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis of 1984/85 data</td>
<td>6</td>
</tr>
<tr>
<td>Draft paper on SR analysis</td>
<td>5</td>
</tr>
<tr>
<td>Local seminar on draft report</td>
<td>5</td>
</tr>
<tr>
<td>Completion of first policy brief</td>
<td>5</td>
</tr>
<tr>
<td>Creation of analysis files from new survey (2003)</td>
<td>11</td>
</tr>
<tr>
<td>Interim meeting</td>
<td>11</td>
</tr>
<tr>
<td>Analysis of 2003 data</td>
<td>9</td>
</tr>
<tr>
<td>Draft paper on LR analysis</td>
<td>7</td>
</tr>
<tr>
<td>Local seminar on draft reports</td>
<td>11</td>
</tr>
<tr>
<td>Completion of second policy brief</td>
<td>11</td>
</tr>
<tr>
<td>Final meeting</td>
<td></td>
</tr>
<tr>
<td>Final revisions</td>
<td></td>
</tr>
</tbody>
</table>
B. Comments by Ignacio Francheschelli

1. I think there is some work to do relating to the measuring of household income shocks the paper mentions they will use instrumental variables but it is not enough clear which variables they are going to use and why they seem to be a good instrument.

Instruments for crop income shocks include self-reported incidence of crop failure due to weather, pests, or soil qualities, as well as self-reported incidence of sickness of household members. Other instruments involving interactions of these with other variables (e.g. presence of irrigation), will also be explored. We think these will make good instruments because they are highly correlated to crop income, but are exogenous to the labor supply decision. These points were noted in footnotes 17 and 18.

Because the document is only a proposal, we did not think it was necessary to include the specifics of which particular variables we are using. There are many possible instruments and variables available, but unless we begin the analysis we cannot as yet decide which ones (or which transformations) are the most appropriate.

2. The research spends a lot of time in the internal validity of the investigation. From my point of view it should spend more time in the external validity of the research. Knowing into which population it could be transmitted the conclusions and results of the paper is also very important. Regarding this aspect I believe there are several poor people – mainly urban poor – whose hours of work seem to be more related to the demand side in the labor market rather than to a supply decision in response to an income shock. I mean in some regions like Argentina, it seems that poor households are not only credit constrained but also labor constrained.

We think this research will be relevant for farm communities elsewhere in the Philippines where agriculture has also been commercialized. The agriculture sector continues to employ about 40 percent of the labor force in the country. Regarding the second point on labor constraints, please see our response to Mr. Scott’s comment 2.i.

3. The paper is really too large. Perhaps it some sections could be shortened like the description of Bukidnon or the description of the questionnaires. Also, I did not find especially useful the household model so perhaps you can include it in an appendix.

Some sections were expanded as a response to comments received earlier suggesting we elaborate on certain aspects of the proposal. However, we do agree that the proposal has become too long and so we have eliminated the tables on the data modules, and placed the summary of credit data in an appendix. On the other hand, we think the household model is important in the development of the empirical approach, so we have kept it in the proposal narrative.
C. Comments by A. S. Oyékâlé

1. I do not think the (1984-2003) in the topic is needed since this is not strictly a time series analysis.

   The inclusive dates were included in the title to make it as descriptive as possible. We think the title “Evidence from Bukidnon, 1984-2003” is general enough to include the two papers we are proposing for this project. Since we did not mention our methodology in the title, we do not think this is misleading.

2. The data set of 1984/85 were conducted in 4 rounds while that of 2003 were done in 1 round. Do you think there would not be serious discrepancies given the fact that the farm household demand for credit and labor shock could be time determined. They need money for productivity only during the cropping seasons.

   The surveys were timed such that it captured typical cropping seasons for corn and rice. On the other hand, sugar may be planted all year round. For the analysis of persistent shocks, only the last 3 rounds of the 1984/85 data will be aggregated to comprise one full year, and used in addition to the 2003 annual cross section. Therefore all cropping seasons within the year will be covered in these annual observations.

3. The authors want to generate a long run effect of labor shock. Do they have enough data points? Do they want to use their rounds for 5 years? I do not think a two period (year) data can generate a time series analysis.

   We only have two data points, which may be viewed as beginning and ending observations. We intend to use the retrospective modules on assets and shocks to control for changes in the household’s characteristics. The objective of the 2-year comparison is to see whether households that were credit constrained 20 years ago, exhibit certain interesting characteristics. Are they more vulnerable to shocks now, than before? Do they rely more on labor supply adjustments to cope with shocks?

   In fact, the data set can be analyzed to answer other questions beyond the scope of our proposed research: How has access to credit affected the evolution of well-being over the long run? Are previously constrained households better or worse off compared to those who were previously unconstrained? Were they able to invest in the human capital of their children? Do their children enjoy a better quality of life than the parents did 20 years ago? We think this 2-year comparison, although limited, can shed light into these (and indeed many other) issues.

4. Page 30 and paragraph 3: I do not think this data generated in 2003 for the past 20 years are reliable for generating a long run effect. Farmers do not keep data for long. Such data are likely to be faulty.
On the contrary, our experience on the field indicates that people can recall the timing of significant shocks pretty well. In general, people can recall the year when droughts occurred, when a family member fell seriously ill, when their livestock was stolen, when there was a period of conflict, and other types of shocks. We did not ask for farming records or anything of that nature. The shocks module concentrated on the type of shocks, when it occurred, and what coping strategies the family used.

5. **Recommend that the authors use 2003 data only.**

Using the 2003 data alone makes the research little different from other studies of labor supply. It is precisely the fact that the 2003 data tracks down the very same households from the 1984 survey which makes it interesting and unique.
Labor responses to income shocks under credit constraints: Evidence from Bukidnon, 1984-2003

Hazel Jean Malapit
School of Economics
University of the Philippines
hazel_jean.malapit@up.edu.ph

Jade Eric Redoblado
Statistics Center
University of the Philippines
jade_eric.redoblado@up.edu.ph

Deanna Margaret Cabungcal-Dolor
dinz_dolor@hotmail.com

August 2004

Abstract

The ability of households to insure consumption from adverse shocks is an important aspect of vulnerability to poverty. How is consumption insurance achieved in a low-income setting where formal credit and insurance markets have been observed to be imperfect or missing? Using longitudinal data from the Philippine province of Bukidnon, this research investigates the smoothing role of ex post labor supply adjustments under credit constraints. In addition, this research will investigate the effects of persistent shocks over the long-term on current labor decisions in light of past credit constraints. The overall goal of this research is to understand how labor supply is used to buffer income shocks given credit constraints, both in the short run and in the long run. Labor is of particular interest because it is often said to be the only asset of the poor. This issue has further implications on which households are most vulnerable to adverse shocks. If credit-constrained households can use labor income to buffer income fluctuations, those that are disadvantaged in the labor market may even be more vulnerable than the credit-constrained. This group may include female-dominated households, households with high dependency ratios, and those with sickly or unhealthy family members.
1. **Main research questions and core research objectives**

   1.1. **Introduction and motivation**

   It has been acknowledged that the ability of households to insure consumption from adverse shocks is an important aspect of vulnerability to poverty (Skoufias and Quisumbing 2002). The increasing attention on risk and vulnerability arose from the mounting evidence that shocks inflict permanent effects on human capital formation, nutrition and incomes. The existence of poverty traps and other forms of persistence has shown that vulnerability to poverty is in itself a source of deprivation. (Dercon 2001)

   Well-being and poverty are the outcome of a complex decision process of households and individuals over assets and incomes faced with risk. On the other hand, vulnerability is an ex ante concept, determined by the options available to the households and individuals to make a living, the risks they face, and their ability to handle these risks (Dercon 2001). The ultimate effect of risk on the well-being of households and individuals depends largely on the coping strategies that may be employed by the household to protect consumption when adverse shocks occur.

   How is consumption insurance achieved in a low-income setting where formal credit and insurance markets have been observed to be imperfect or missing? As noted by Kochar (1999), it is widely believed that this is achieved through asset transactions. However, there are a variety of formal and informal mechanisms households may employ to insure consumption from fluctuations in income. These risk-management strategies include: community risk-sharing (e.g. reciprocal arrangements, state-contingent remittances), income diversification, adoption of low-return low-risk crop and asset portfolios, savings depletion, sale of assets, borrowing, and ex-post labor supply adjustments, among others.
Because labor is often the only asset of the poor, this study will focus on the smoothing role of labor supply when households cannot borrow to insure consumption. Using a collective model, this study will look at the distribution of the labor supply response within the household. In addition, this research will investigate the effects of persistent shocks on current labor decisions in light of past credit constraints. Households responding to adverse shocks over a long period of time may rely more on labor income if they were credit constrained in the past. This may reflect on the current share of labor in total household income, and on current occupational choices, including migrant work.

This research differs from past studies by explicitly looking at both labor decisions and credit constraints, in the context of transitory as well as long run shocks.¹ Most empirical studies of credit constraints have focused on outcomes in the short to medium term.² However, there is scant evidence on the effects of credit constraints in the long run, primarily because of the absence of longitudinal data linking past credit constraints to current outcomes.

In addition, it proposes to investigate the labor supply response within the framework of a collective household model. Contrary to the notion that households are composed of individuals with common preferences, the collective model allows for differences in opinion in economic decisions. How conflict is resolved within the household may depend on the relative bargaining strengths of the individuals. Analyzing labor supply

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¹ In the labor literature, the increase in household labor supply as a response to fluctuations in household income (e.g. unemployment of the breadwinner, crop failure) is referred to as the ‘added worker effect’. Because the presence of credit constraints limits the set of coping strategies available to households, the ‘added worker effect’ is expected to be stronger when households are unable to borrow to maintain consumption (Cullen and Gruber 1996; Lundberg 1985; Mincer 1962). Labor supply was seldom studied explicitly within the context of credit constraints, with the exception of García-Escribano (2003).
² For example, Carter (1989) finds that credit use is associated with greater agricultural productivity in the short run, while Banerjee and Duflo (2002) find that improved credit access lead to higher short run output for credit constrained firms.
responses to shocks in this framework allows for the possibility that some members may be adjusting to income shocks more than others.

This study will capitalize on the unique features of the Bukidnon dataset collected by the International Food Policy Research Institute (IFPRI) and the Research Institute for Mindanao Culture (RIMCU). The data is longitudinal, following the same 510 core households in 1984-85 (four rounds, 4-month recall), and in 2003 (one round, 12-month recall). The long intervening period between the two surveys allows us to study the long-term effects of past credit constraints on current outcomes.

The research site was originally selected to study the effects of agricultural commercialization on consumption and nutrition outcomes. Construction of a sugar mill in the area in 1977 led to a major shift from corn production to sugar production for many households in the region. The original case study (Bouis and Haddad 1990) examined the effects of the shift from subsistence corn production to sugarcane after the construction of a sugar mill. The main effects of the introduction of export cropping were: a significant deterioration in access to land, as smallholder corn tenant farms using primarily family labor were consolidated into larger sugar farms using primarily hired labor; an increase in incomes for households that grew sugarcane; a decline in women’s participation in own-farm production; and very little improvement in nutritional status as a result of increased incomes from sugarcane production, primarily because of the high levels of preschooler sickness in the sugarcane-growing households. Deteriorating land access in the face of increased commercialization is an especially important issue in Mindanao, the Philippines’ poorest region, which has a long history of armed conflict.³ Policymakers have recognized the need

³ See Malapit, Clemente and Yunzal (2003) for an overview of the Mindanao conflict.
both to reduce poverty in Mindanao and to improve financial services in this area (Medium Term Philippine Development Plan 2002-2004).

Because of the prevalence of multiple market failures in developing countries, the welfare implications of credit constraints for poor farmers are deeply interlinked with the degree of commercialization. In general, the production of crops primarily for sale rather than for subsistence leads to greater use of marketed inputs and can also affect the distribution of land if the optimal farm size differs between the cash and subsistence crops. In addition, many cash crops are subject to greater production risk than basic food crops. Thus, the decision to grow semi-subsistence food crops may reflect greater risk aversion, particularly for the poor. These factors affect the sources of demand for credit between the two types of farming: commercialized farmers are likely to have greater demand for credit to finance crop production than semi-subsistence food crop farmers. Whether commercialized farmers also have greater demand for credit as a form of insurance and consumption smoothing depends on the relative riskiness of the cash crop. Differences in the production environment also affect default risks and loan sizes, so that the probability of being credit constrained differs by degree of commercialization as well. (Quisumbing and Montillo-Burton 2002)

1.2. Objectives of the research program

The overall goal of this research is to understand how labor is used to buffer income shocks given binding credit constraints, both in the short run and in the long run, and assess how these patterns differ between commercialized versus food crop-oriented households.

1.2.1. General statement of research objectives

The proposed research project aims to:
a. Understand how households of different asset classes and commercial orientation have used labor to cope with transitory and persistent shocks;

b. Analyze how credit constraints have affected labor choices in the short run and in the long run.

1.2.2. Specific research issues

As part of the research agenda, we expect to address the following specific research questions on the effects of shocks on labor decisions for credit-constrained sugar and corn producing households in Bukidnon:

a. Are credit-constrained households more likely to increase market hours of work in response to negative transitory income shocks? Which members of the household are more likely to adjust their market hours of work when shocks occur? How does this labor supply response differ between sugar and corn farmers? How does relative bargaining power between spouses affect this labor supply response?

b. Were households that were credit constrained in 1984 more likely to use labor to cope with persistent shocks? Are they more likely to have a higher share of income from labor in 2003? Are they more likely to choose specific occupations in 2003? How does relative bargaining power between spouses affect current labor choices?

c. Were commercialized sugar farmers, who had higher average incomes than corn farmers in 1984, less likely to use labor income to smooth persistent shocks? To what extent does credit access explain the observed difference in performance?
2. Scientific contribution of the research and knowledge gaps

This research builds on two separate strands of literature: (i) the consumption smoothing literature, and (ii) the literature on the smoothing role of secondary earners.

2.1. Consumption smoothing

The perfect risk-sharing hypothesis implies that, once aggregate shocks are accounted for, the growth rate of consumption would be independent of any idiosyncratic shock affecting the resources or income available to the household (Cochrane 1991, Deaton 1992, Townsend 1995, Skoufias and Quisumbing 2002). Thus, the greater the correlation between household consumption and income, the less effective the risk-management strategy adopted by the household. This approach has also been used to assess the role of credit and savings as insurance substitutes, and make inferences on liquidity constraints\(^4\) (Skoufias and Quisumbing 2002).

Although empirical work on consumption smoothing has rejected the full risk-sharing hypothesis (Cochrane 1991, Townsend 1995), there is evidence that the overall effect of idiosyncratic income shocks on household consumption is not large. This implies that some mechanisms or channels, including those that in a first best allocation would be considered sub-optimal, absorb most of the shocks. (Garcia-Escribano 2003)

Research on low-income economies (for example, see Morduch 1995) show that households use a mix of formal and informal strategies to cope with adverse shocks including: community risk-sharing (e.g. reciprocal arrangements, state-contingent remittances), income diversification, adoption of low-return low-risk crop and asset

\(^4\) One key insight in the simulation results of Deaton (1991) is that a credit-constrained household may still be able to smooth consumption using precautionary savings, thus remaining consistent with the permanent income hypothesis (Skoufias and Quisumbing 2002).
portfolios, savings depletion, sale of assets, borrowing, and ex-post labor supply adjustments, among others. However, different households may have differential access to these strategies. Poorer households in particular, may be less able to use strategies that rely on initial wealth as collateral (Skoufias and Quisumbing 2002). On the other hand, it is often possible to adjust labor supply, regardless of initial wealth.

As noted by Kochar (1999), past research has demonstrated that farm households in developing countries are able to protect consumption from idiosyncratic shocks but offers little evidence on how this is achieved. To be able to understand the underlying economic environment, it is important to study how and to what extent specific mechanisms isolate consumption from the effect of idiosyncratic income shocks. Much of the work on consumption smoothing has focused on the contribution of assets in buffering consumption variability (Garcia-Escribano 2003, Kochar 1999). However, these studies may not be relevant in explaining how consumption insurance is achieved in low-income communities, where asset levels may be low and access to credit limited.

2.2. Smoothing role of secondary earners

The literature exploring the role of secondary earners in smoothing transitory shocks to the household head’s earnings may be divided into two. The first set finds evidence of an insurance effect of secondary earners to the extent that it crowds out precautionary savings (Kochar 1995, 1999, Merrigan and Normadin 1996, Engen and Gruber 2001, Low 1999). Kochar (1995, 1999) concludes that well-functioning labor markets in Indian villages allow households to increase labor income in response to crop shocks, reducing the need to resort to asset depletion or borrowing to smooth consumption. Using UK household data, Merrigan and Normadin (1996) find that precautionary motives are stronger for households
with two earners compared to households with a single earner. Similarly, Engen and Gruber (2001) find that the effect of an increase in unemployment insurance on wealth holdings is smaller for married couples than for singles in the US. Lastly, Low (1999) uses numerical methods to show that precautionary savings in households with a secondary earner is smaller only if the correlation between shocks to the potential wages of the husband and wife is sufficiently negative.

The second set of literature explores the smoothing role of secondary earners through the ‘added worker effect’. The ‘added worker effect’ refers to the temporary increase in female labor supply (participation or hours worked) in response to transitory shocks to household income (excluding the wife’s income). Most studies estimate female employment or female hours worked as a function of the husband’s labor status together with standard covariates (e.g. labor market characteristics, household fixed effects). However, some studies have extended the definition of the husband’s earnings loss to account for underemployment (Maloney 1987) or idiosyncratic earnings shocks other than unemployment (Garcia-Escribano 2002).

The presence of liquidity constraints is one of the main arguments put forward in support of the existence of the ‘added worker effect’ (Mincer 1962; Lundberg 1985; Cullen and Gruber 1996; Finegan and Margo 1994; Garcia-Escribano 2003). Cullen and Gruber (1996) report evidence that families are liquidity-constrained during unemployment spells. This finding is consistent with Stephens (2001), where empirical results for layoffs are consistent with liquidity-constrained households. Similarly, Garcia-Escribano (2003) finds that households with limited credit access rely on the labor supply of wives to smooth the husband’s earnings shocks.

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5 See Malapit (2003) for a review of literature on the ‘added worker effect’.
The empirical results in the literature investigating the ‘added worker effect’ remains mixed. Arguments put forward in support for the ‘added worker effect’ include: the substitutability of leisure of husbands and wives in home production (Ashenfelter 1980; Lundberg 1985; Maloney 1987); an income effect (Maloney 1987; Prieto and Rodriguez 2000); and, the presence of liquidity constraints (Mincer 1962; Lundberg 1985; Cullen and Gruber 1996; Finegan and Margo 1994; Garcia-Escribano 2003).

On the other hand, other factors that may obscure this effect include: assortative mating in tastes for work among spouses (Maloney 1991; Lundberg 1985; Cullen and Gruber 1996); the wife’s employment factors are affected by the same factors causing the husband’s unemployment, or the ‘discouraged worker effect’ (Serneels 2002; Prieto and Rodriguez 2000; Baslevent and Oneran 2001); a crowding out effect from social insurance programs (Cullen and Gruber 1996; Finegan and Margo 1994); the value of the unemployment benefit is linked to the wage received by the wife (Cullen and Gruber 1996); and, different measurement approaches (Lundberg 1985).

Among the knowledge gaps that emerge from this brief review is the consideration of liquidity constraints. While it has been cited as the driving force for the ‘added worker effect’ in the life cycle context, few studies explicitly include liquidity constraints in their empirical models. This line of research is perhaps more relevant for developing countries where credit markets are imperfect and there are little unemployment benefits.

In addition, only two studies extend the notion of the ‘added worker’ to other family members (Serneels 2002; Kochar 1999), although in general, the ‘added worker effect’ refers to all potential secondary earners in the family, including children. This point may have been irrelevant in the developed country context where households are often nuclear, but it is not so in the case of developing countries. A number of studies have linked child labor with
income shortfalls and credit constraints (Jacoby and Skoufias 1997, Dehejia and Gatti 2002), emphasizing that parents may be forced to draw on their children’s labor when other strategies such as credit are not available.

2.3. Contribution of the research

Building on the research gaps from the intersection of both strands of literature, this study will examine how labor is used to buffer income from both transitory and persistent shocks given binding credit constraints. Households that were credit-constrained in the past may have fewer coping strategies available to it when shocks occur. Over a long period of time, this could manifest in their occupational choices and proportion of income from labor.

Only a handful of studies on the ‘added worker effect’ use data on developing countries, primarily as a consequence of the dearth of panel data. Such studies would also require analytical methods more suited to the specific labor market characteristics in the developing country context. Also, sources of income shocks may be more diverse for agricultural households (not merely unemployment), and the ‘added worker effect’ is relevant for all potential secondary workers, which include children. An exception is the work by Kochar (1999), which estimated hours of work responses to idiosyncratic crop shocks in rural India. Her model distinguishes labor supply by gender, and all household members aged 15 to 45 may contribute to labor income. However, her model does not accommodate credit constraints.

Using longitudinal data for the Philippine province of Bukidnon, this proposed research provides a rare opportunity to study the use of labor to buffer transitory as well as persistent shocks. The primary contribution of this research is the empirical analysis of the short run and long run labor responses of households to shocks given borrowing
constraints. The use of labor as insurance is of particular interest because it is often the only asset of the poor, who are also less likely to have adequate access to credit. By investigating both labor supply and credit constraints, this research will deepen our understanding of vulnerability to poverty, and facilitate more effective policy analysis.

3. Policy relevance

The province of Bukidnon is located in the Philippines’ poorest island group of Mindanao. The National Statistical Coordination Board (NSCB) reports that in year 2000, six out of the ten poorest provinces were located in Mindanao. Their 1997 and 2000 poverty incidence rankings are shown in Table 1. Poverty incidence for Region 10, where Bukidnon is located, showed some improvement from 37.8 percent in 1997 to 32.9 percent in 2000. However, this remains high compared to the national average of 28.1 percent in 1997 and 28.4 percent in 2000. (NSCB 2000)

Tables 2 and 3 report the bottom ten Philippine provinces for the Human Development Index (HDI) and the Quality of Life Index (QLI) rankings in 1997, and their previous ranking in 1994. Note that majority of the provinces with the lowest HDI and QLI for 1997 were also located in Mindanao. While Bukidnon has shown some improvement in its 1997 QLI, it is still among the lowest ranking provinces in the country.

<table>
<thead>
<tr>
<th>Table 1: 10 Poorest Provinces in Year 2000</th>
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<td>Province</td>
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<td>Sulu</td>
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<td>Masbate</td>
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<td>Tawi-Tawi</td>
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<td>Ifugao</td>
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<td>Romblon</td>
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<td>Maguindanao</td>
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<td>Lanao del Sur</td>
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6 The HDI is a composite index of life expectancy, functional literacy, and real per capita income. The QLI is a composite index of number of births attended by a medical professional, under-five nutrition, and elementary cohort survival rate.
<table>
<thead>
<tr>
<th>Province</th>
<th>1994 Ranking</th>
<th>1994 Ranking</th>
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</thead>
<tbody>
<tr>
<td>Sultan Kudarat</td>
<td>36.6</td>
<td>54.3</td>
</tr>
<tr>
<td>Camiguin</td>
<td>32.5</td>
<td>53.1</td>
</tr>
<tr>
<td>Camarines Norte</td>
<td>49.7</td>
<td>52.7</td>
</tr>
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Table 2: Bottom 10 Provinces in HDI 1997

Table 3: Bottom 10 Provinces in QLI 1997

Note: Provinces in boldface are located in Mindanao.

It is interesting to note that while Bukidnon is not among the poorest provinces in Mindanao, it has one of the worst income distributions in the country. Bukidnon registered a Gini coefficient of 0.4871\(^7\), the seventh worst distribution in the country (NSCB 2000). This compares poorly to the national average of 0.4814 (NSCB 2000). This result is not surprising considering that Bukidnon is home to large-scale plantations such as Del Monte, Dole and other large sugar plantations, as well as small semi-subsistence farmers.

Our interest in this study is the condition of those small farmers, whose poverty is masked by the wealth generated by the few. This is reflected in the original sampling of the survey households, where only households that have farmed less than 15 hectares were eligible for selection. A pre-survey of 2,039 randomly selected households indicated that larger farms – above 15 hectares – accounted for less than 3 percent of all households. (Bouis and Haddad 1990)

\(^7\) NSCB (2000) reports that 4 of the 10 provinces with the highest Gini coefficient were from Mindanao: Zamboanga del Norte (ranked 1), South Cotobato (ranked 3), Lanao del Norte (ranked 4) and Bukidnon (ranked 7).
The proposed study attempts to capture only one aspect of the household’s behavioral response to risk – labor supply adjustments as an ex post risk-coping strategy. If household labor is important in insuring consumption, the cost of income uncertainty may be reflected in decisions that affect the household’s labor endowment, such as education and fertility outcomes, and decisions on migration (Kochar 1999). In addition, relying on labor as insurance may have negative repercussions on the household’s future ability to cope with shocks, as when households increase child labor at the expense of schooling investments.

This issue has further implications on which households are most vulnerable to adverse shocks. If credit-constrained households can use labor income to buffer income fluctuations, those that are disadvantaged in the labor market may even be more vulnerable than the credit-constrained. This group may include female-dominated households, households with high dependency ratios, and those with sickly or unhealthy family members.

Researchers have emphasized that understanding the specific strategies used by households to protect consumption against income fluctuations is crucial for the design of an effective social protection policy. Dercon (2001) notes that, “The World Development Report 2000/01 acknowledges that vulnerability reducing policies should be more than safety net policies, but convincingly argue to start from the observed strategies used by individuals, households and communities. Optimal policy design should aim to strengthen, complement and replace existing strategies to obtain maximal reduction in vulnerability.” If indeed labor markets effectively fill the gaps in credit and insurance markets, the implications for policy interventions may be very different. For instance, would interventions such as

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8 Kochar (1995) finds that while small-farm households are relatively disadvantaged in their access to credit, they are able to mitigate the effects of crop shocks through increased market labor. However, households that are most vulnerable to crop shocks are those with few males, suggesting that farm households are more vulnerable to demographic shocks than to crop income shocks.
public works or health programs be more effective than credit market interventions in promoting economic security?

The empirical results of this study can provide direction for optimal policy design. If we find that credit constrained households are able to use labor income to protect consumption from transitory shocks, then short-term workfare or livelihood programs may significantly reduce the vulnerability of households in these communities. This may be further refined to target specific members (e.g. women) if our results show that they less able to use labor as insurance. Similarly, if we find that households use labor as insurance in the long run, then programs with longer run effects such as health programs may complement this coping strategy.

Despite the limited coverage of the data set, we argue that there are unique advantages from the specific design of this data that allows analysis of issues that cannot be undertaken using existing nationally representative surveys. Longitudinal data sets are very rare, even more so for the Philippines. It is highly unusual to be able to follow a cohort of individuals and their offspring to examine the long-term impact of credit constraints. Most poverty comparisons are conducted using repeated cross-sections, whereas a true panel allows one to control for individual and household-specific characteristics.

The research site was originally chosen as part of a study on the nutritional impact of agricultural commercialization. In the context of trade negotiations and other policy debates, issues of agricultural commercialization (i.e. sugar vs. corn) remain very important regardless of where they are taking place. The very same issues that arise from changes in the rural and financial markets brought about by agricultural commercialization in Bukidnon may be the

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9 We are aware of only one other longitudinal data set for the Philippines, the Cebu Longitudinal Health and Nutrition Survey (CLHNS), conducted by the Carolina Population Center and the University of San Carlos. However, this data set is not suited to our research objectives since it does not have information on credit constraints and shocks.
same issues arising in other provinces, such as Negros. These are aspects of poverty that have rarely been studied in the Philippines.

Existing nationally representative surveys in the Philippines are already being used by a number of economists for standard poverty analyses. However, the lessons we can learn from the study of this specialized data set are more than typical. This research can make a substantial contribution to our understanding of pathways out of poverty, and the role of labor decisions and credit constraints in this process.

Over the past two decades, the transformation in Bukidnon’s economic landscape due to commercialization of agriculture and the process of globalization has created greater uncertainty in agricultural communities. Households are now subject to more shocks (e.g. relative price fluctuations, large systemic shocks). These are magnified by the transmission process inherent in an integrated economy. With more volatility expected upon the reduction of sugar tariffs by 2010, the issues surrounding consumption insurance and vulnerability to poverty have become increasingly relevant.

The reliance of farm households on labor as insurance also has significant macroeconomic implications especially when dealing with shocks like economic crises and policy shifts. Unlike idiosyncratic income shocks, these shocks affect entire communities at the same time, weakening or even nullifying traditional sources of credit or transfers. In such cases, the use of labor as insurance may no longer be viable when households are competing with so many ‘added workers’ in the labor market.

The proposed research project is consistent with the priorities of the Philippine government. Its Medium Term Philippine Development Plan (MTPDP) states the following priorities: (1) to develop the banking and capital market, including improving financial intermediation through support given to microfinance institutions; (2) to develop Mindanao
as a food basket and exporter of high value agriculture and fisheries products; (3) to protect vulnerable groups through better delivery of social services, including microfinance programs.

4. Methodology

What follows is an outline of the proposed methodology for this study. The first section presents the conceptual framework, followed by a discussion of the specific techniques proposed for the empirical analysis. The last section raises important empirical issues and the proposed remedies.

4.1. Conceptual framework

This section will outline the conceptual underpinnings of this research. We begin with a discussion of the unitary and collective household models to establish the theoretical relationships we wish to explore. The next section will discuss the theoretical treatment of permanent versus transitory shocks and its implications on labor supply. Lastly, we outline the implications of the collective model on the ‘added worker effect’.

4.1.1. Unitary model

To simply the exposition, we begin with the conventional intertemporal family labor supply model where the household acts as a single decision-making unit (Killingsworth and Heckman 1986). This approach is adapted to an agricultural setting, where farming is a significant source of household income. For period \( t \), the farm profit function may be represented by:

\[
\pi_t = \pi(h_t^o, x_t, p_t, \theta_t),
\]
where \( h_t^o \) is own-farm labor hours, \( x_t \) is a vector of other inputs including hired labor, \( p_t \) is a vector of prices, and \( \theta_t \) is the realization of weather and other crop income shocks. To simplify notation, assume that the household does not distinguish between the labor hours of its members. The household’s optimization problem is given by:

\[
\begin{align*}
\max_{\{h^o, h^m, c\}} & \quad EU = \sum_{t=0}^{\infty} \beta^{-t} U(c_t, h_t^o, h_t^m, z_t), \\
\text{s.t.} & \quad (2.1) \quad a_{t+1} = (1 + r_{t+1})(a_t + w_t h_t^m + \pi_t - c_t), \\
& \quad (2.2) \quad h_t^o + h_t^m + l_t = \Omega_t, \\
& \quad (2.3) \quad a_t \geq 0, \\
& \quad (2.4) \quad c_t \geq 0; \quad h_t^o \geq 0; \quad h_t^m \geq 0; \quad l_t \geq 0.
\end{align*}
\]

Assuming that utility functions are additively separable over time, the household maximizes the expected value of time and preference discounted utility (2), subject to the intertemporal budget constraint (2.1), time-endowment constraint (2.2), credit constraint (2.3), and the non-negativity constraints (2.4). Total household consumption is given by \( c_t \), \( z_t \) is a vector of observed and unobserved factors affecting preferences, \( w_t \) is the market wage, \( a_t \) is the household’s assets at the beginning of period \( t \), and \( r_{t+1} \) is the exogenous interest rate in the next period. Farm profits are defined as the value of output net of all costs excluding family labor, given by (1). The household’s labor endowment \( \Omega_t \), may be allocated to own-farm work \( h_t^o \), market work \( h_t^m \), and non-market work or leisure \( l_t \). For simplicity, the credit constraint takes the form of a non-negativity constraint on assets.\(^\text{10}\) This

\(^{10}\) While there is evidence that households do not draw assets down to zero (Kochar 1999), setting a positive lower limit on assets rather than zero does not significantly alter the optimality conditions.
model can easily be extended to distinguish the labor hours of members according to gender and/or age by disaggregating hours of work and wages for each labor category.

This optimization yields labor supply functions that depend on aggregate consumption, own wage, hours worked in own-farm, non-labor income, farm profits, earnings of other family members, marginal utility of wealth ($\lambda_t$), and preference shifters ($z_t$).

\begin{equation}
(3) \quad h_t^n = h_t^n(c_t, h_t^w, w_t, \pi_t, \lambda_t, z_t)
\end{equation}

4.1.2. Collective model

In recent years, there has been growing evidence contradicting the unitary model both in developed and developing countries\footnote{See Strauss and Thomas (1995) for a review.}. An alternative is the collective model, which allows for differences of opinion on economic decisions among household members. This model suggests that when disagreement occurs, how it is resolved may depend on the relative bargaining power of individuals within the household (Manser and Brown 1980, McElroy and Horney 1981, Quisumbing and Maluccio 2003). Time allocation and labor force participation decisions may very well be the result of previous bargaining (Quisumbing and Maluccio 2003).

In addition, conflict-resolution within the household is extremely relevant in the choice of coping strategies. When shocks occur, couples may have differing preferences on which member should work more, which expenditures should be cut, or which child should be pulled out from school. Because the choice of strategies undertaken may result in intertemporal trade-offs (e.g. sale of productive assets, or schooling of children), the collective framework provides important implications for policy and program design.
In a two-person household where preferences are altruistic, so each person \( (i = m, f) \) cares about the other’s allocation, we can write the single-period maximization problem as:

\[
\max \text{ } \mu U_m(c_m, c_f, h^o_m, h^o_f, h^m_m, h^m_f, z) + (1 - \mu) U_f(c_m, c_f, h^o_m, h^o_f, h^m_m, h^m_f, z),
\]

subject to the same constraints outlined in the unitary case. It is simple to see that this general model reverts to the unitary model if the individual utility functions are identical (common preferences), or if the sharing rule \( \mu \) is equal to zero or one (dictator).

It is likely that this sharing rule is related to the relative bargaining power of individuals within the household. Letting \( b_m \) and \( b_f \) represent proxy measures for bargaining power that influence \( \mu \), market labor supply functions can be expressed as:

\[
\text{...}
\]

The effect of individual bargaining power on market labor supply of person \( i \) can be interpreted as the effect of changing the share of household income allocated to each household member, holding household income constant. The key result of the unitary model, income pooling, implies that the identity of the income earner, or the person in control of the resources is irrelevant. Thus, if income pooling holds, these effects should be zero:

\[
\frac{\partial h^m_i}{\partial b_j} = 0, \quad j = m, f
\]

As suggested by Quisumbing and Maluccio (2003), this provides a straightforward test of the unitary model by including proxy measures for male and female bargaining power in the estimation of labor supply functions. Valid proxy measures are culturally relevant factors that reflect bargaining power and are exogenous to decision-making within marriage.

Using anthropological evidence from rural Philippines, Quisumbing (1994) argues that inherited landholdings are a valid measure of bargaining power since land is usually
given as part of the marriage gift and major asset transfers occur at the time of marriage. Following recent literature, we propose to use human capital and assets brought into the marriage as proxy measures of bargaining power (Quisumbing and Maluccio 2003).

### 4.1.3. Permanent versus transitory shocks

Recall the results of the permanent income hypothesis, where consumption is constant over the lifecycle and is dependent on permanent income. Temporary fluctuations in income are thus smoothed through credit and savings and should not affect consumption. Following this argument, only permanent shocks should affect labor decisions. This is the foundation of the consumption smoothing literature.

Contrary to the permanent income hypothesis, the ‘added worker’ hypothesis predicts that negative transitory shocks to household income, through farm profits or earnings of other family members, will result in a contemporaneous increase in market hours of work, all other things equal. The theory also implies that the increase in market hours of work will be temporary, and will no longer be necessary once the shock has subsided.

In his classic article on female labor supply, Mincer (1962) showed that in a given period, the ‘temporary’ reduction in family income due to the husband’s unemployment increases the probability that the wife will participate in the labor market in that period. He emphasized that this effect is expected when the family have few consumption-smoothing alternatives: “However, if assets are low or not liquid, and access to the capital market costly or nonexistent, it might be preferable to make the adjustment to a drop in family income on the money income side rather than on the money expenditure side … a transitory increase in labor force participation of the wife may well be an alternative to dissaving, asset decumulation, or increasing debt.” (Mincer 1962)
On the other hand, Heckman and MaCurdy (1980) observed that ‘permanent’ factors resulting to higher unemployment probability of the husband should increase the labor supply of wives over their lifetimes, and not only during the periods of unemployment. Thus, in a life-cycle setting, the ‘added worker effect’ cannot be expected to be large unless in the presence of credit constraints (Lundberg 1985; Heckman and MaCurdy 1980). Lundberg (1985) notes that without such a constraint, the wealth effect of a short unemployment spell is likely to be small, and contemporaneous movements in the labor supply of a married couple will reflect only cross-substitution effects, which are expected to be small.

4.1.4. ‘Added worker effect’ in the collective model

The collective model, where the distribution of consumption and work is determined by relative bargaining power, has important implications on the ‘added worker effect.’ First, it implies that reservation wages for wives are lower than in a unitary setting, because she is entitled to only a fraction of her husband’s income. The size of her share depends on the relative bargaining strengths between her and her husband. Lower reservation wages implies higher labor market participation, because more job offers become acceptable, all things remaining the same.

Second, the ‘added worker effect’ may be larger or smaller depending on relative bargaining power. Initially, a smaller share of the husband’s earnings implies a weaker income effect. However, depending on the bargaining process in the household, it is also possible for those members with less bargaining power to absorb a larger share of the cost of the income shock. The consumption and leisure of the more powerful family members may be insured, while the consumption and leisure of the less powerful family members are the ones that adjust.
This research proposes to investigate both types of shocks within a collective framework: those that are transitory, occurring within a four-month recall period, and those shocks that may still be transitory yet persistent, occurring over the last twenty years. If credit constraints are binding, both types of shocks are expected to result in labor supply adjustments. Following the arguments outlined above, credit constrained households subjected to adverse shocks over a long period of time may be expected to exhibit the following characteristics: a larger proportion of income contributed by labor, and a preference for particular occupations (e.g. agricultural laborer).

4.2. Empirical Analysis

We can divide the empirical analysis into two parts, covering the two periods of analysis. The first part will use the 1984/85 panel data\textsuperscript{12} to investigate whether credit constrained households increase market hours of work in response to temporary income shocks. The second part will compare the 1984/85 and 2003 cross-sections\textsuperscript{13} to investigate how shocks over the last two decades affect current (2003) occupational choices and shares of labor incomes given past (1984/85) credit constraints.

To address the specific research issues we must first devise a method to segregate households into cohorts that are credit-constrained or unconstrained. Next, we define the method by which we measure household income shocks that elicit the labor supply response. For the short run analysis, we estimate labor supply as a function of household income shocks and compare the parameter estimates for constrained versus unconstrained households. To identify which family members perform this insurance function, we can

\textsuperscript{12} The 1984/85 data is a four-round panel collected at four-month intervals. The last three rounds can be aggregated to comprise one full calendar year.

\textsuperscript{13} The 1984/85 annual data will be compared to the 2003 data, which is a one-round resurvey of the same households with a 12-month recall period.
estimate the labor supply response for different categories of family members by age and gender. Because households vary in size and composition, family members may be grouped by gender and age, and their labor supply aggregated for each category. For the long run analysis, we can use three dependent variables: (i) share of labor in total household income, (ii) share of transfers in total household income (conditional on migration of a household member), and (iii) occupational categories (which can include migrant work). Again, these can be estimated as functions of long run shocks, and the parameter estimates compared for constrained versus unconstrained households.

4.2.1. Identifying credit-constrained households

In the proposed theoretical model, the credit constraint is represented by a non-negativity condition on net assets. Thus the credit constraint binds for a particular household if, at any time period, optimal consumption exceeds all its available resources. This model represents the extreme case where total liabilities cannot exceed the total value of assets. It also implies that households with little or zero assets will not have access to credit.

Since we are interested in current labor responses to long run shocks in light of past credit constraints in the long run analysis, we shall focus on how to use the 1984/85 data in identifying credit-constrained households. As a general definition, we define a household to be credit-constrained if it would like to borrow, for whatever purpose, but cannot obtain credit at acceptable terms from any source. We shall no longer distinguish between formal and informal credit sources as they can function equally well in protecting consumption from income shocks.

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14 Alternatively, household members may be indexed according to relationship to household head. This grouping is useful if there are informal social rules on who (in the family) must bear the adjustment.

15 In Jappelli (1990), a household is defined to be credit-constrained if the demand for credit exceeds the credit limit, or the amount lenders are willing to supply given the household’s characteristics. Our model presents the special case where the credit limit equals the total value of assets.
One common method of testing for credit constraints is the consumption insurance hypothesis. If the growth rate of household consumption covaries with the growth rate of household income, then the household is said to be credit-constrained. The seasonality of agricultural production prevents us from calculating household income per round for the 1984/85 data, but household-level measures of consumption variability can be computed and used to classify households into constrained and unconstrained. However, one cannot simply look at the smoothness of consumption and know which mechanisms are at work. If labor income can be used to smooth consumption, consumption will appear to be insured even in the presence of binding credit constraints. Thus, to identify households that face binding credit constraints, a direct approach based on household responses to qualitative questions on credit will be necessary.

Rounds 2-4 of the 1984/85 data included questions on credit use and constraints as part of the production questionnaires for sugar, corn and rice producers and under other sources of income for all households. In addition to the amount borrowed and source, respondents were asked why they did not receive credit, if they needed more production credit than they obtained, how additional credit would have been used, and why they thought they could not obtain more credit. Following our operational definition, those households that would welcome additional credit can be classified as self-reported credit-constrained.

Given households’ responses regarding their unmet loan demands, households can be directly identified as constrained or unconstrained. Following Jappelli’s (1990) approach, this classification can be regressed onto a set of household characteristics to obtain estimates of the likelihood that a household will be credit-constrained given a set of characteristics. Jappelli’s (1990) empirical model is a reduced form of optimal consumption in the absence
of a credit constraint, and the debt ceiling.\textsuperscript{16} Although optimal consumption and credit limits are both unobservable, given the direct identification of households for which the constraint binds (e.g. rejected applicants and discouraged borrowers), we can define the dummy variable as:

\begin{equation}
Q = 1 \text{ if } X'\gamma + \mu \geq 0 \quad \text{(credit-constrained)}
\end{equation}

\begin{equation}
Q = 0 \quad \text{otherwise} \quad \text{(unconstrained)}
\end{equation}

where $X$ is a matrix of observable household characteristics, $\gamma$ is the linear combination of parameters in the optimal consumption and credit limit equations, and $\mu$ is the difference of error terms with mean zero. However, because the direct question refers only to production credit, understating the credit constrained non-agricultural households, it is necessary to correct for sample selection bias using a standard two-step Heckman procedure. The predicted status of each household from the regression may then be used to group households.

\subsection*{4.2.2. Measuring household income shocks}

From the theoretical model, labor supply functions depend on a set of variables including farm profits, non-labor income, and earnings of other household members. Shocks entering through any of these factors may result in adjustments in market labor supplied for credit-constrained households. Because our data deals with agricultural households, fluctuations in crop income are significant sources of household income shocks.

\textsuperscript{16} Jappelli (1990) defines a consumer to be liquidity constrained if $C^* - Y - A(1 + r) > D$, where $C^*$ is optimal consumption in the absence of a credit constraint, $A$ is the stock of assets, $r$ is the exogenous real interest rate, $Y$ is current income and $D$ is the debt ceiling.

In a cross-section, the reduced form for $C^*$ may be expressed as $C^* = X'\alpha + \varepsilon$, where $X$ is a matrix of observable cross-sectional variables. The debt ceiling is a function of the same variables plus an error term capturing unobservable factors, $D = X'\delta + \eta$. Rewriting the first equation, a consumer is credit constrained if, $X'\alpha - T - A(1 + r) - X'\delta + \varepsilon - \eta > 0$. 

39
Several approaches may be used to measure crop income shocks. The first alternative is to use the residual from a profit regression (Kochar 1999). Positive and negative residuals may be treated as separate shocks, since strategies used by households to respond to positive shocks are expected to be very different from strategies used to respond to negative shocks. One problem with this approach is that this residual contains unobserved variables that determine household expectations, as well as measurement error in profits. Because the profit regression excludes costs of family labor and other family owned inputs, it also contains unobserved preference shocks that determine leisure choices.

In addition, agricultural production is inherently seasonal so that farm income is sometimes negative and sometimes positive depending on the production stage. Kochar (1999) deals with this problem by dividing the production process into two stages: the planting or planning stage, and the harvest stage. However, this approach is ill-suited to our data because: (i) we have a short panel of only four rounds, and (ii) planting and harvest stages do not necessarily coincide for the farm households, even if they plant the same crop. It is, however, possible to estimate the profit regression for the full year as captured by the last three rounds of the survey.

The second alternative is to use standard instrumental variables techniques. This avoids the problems associated with the first approach if there is an instrument that is correlated with the “true” idiosyncratic crop shock but not with preference shocks or measurement error in crop profits. Because the Bukidnon data set provides a wide set of instruments, this shall be the central approach adopted in this study. However, even if the correlation with the error term is weak, if the instrument does not have a strong enough correlation with the variable, a large bias may exist.

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17 Possible instruments include village-level rainfall data and incidents of crop failure, as well as their interactions with other variables (e.g. presence of irrigation).
In addition to crop income shocks, the analysis can be extended to other types of transitory shocks by constructing indicator variables.

On the other hand, persistent shocks are collected for the last 20 years in the 2003 survey. Various sources of shocks are documented including: weather or environmental shocks affecting crops or livestock (e.g. drought, flooding, pests, diseases); war, civil conflict, banditry and crime (e.g. theft, military presence); political, social and legal events (e.g. confiscation of land, land reform), unexpected economic shocks (e.g. lack of financing, inability to sell inputs); and unexpected events affecting health or welfare of members (e.g. death, illness, disablement, divorce, abandonment). Respondents are reminded that the shocks they should report must have been difficult to foresee and must have significantly affected their households.

It may also be necessary to classify shocks according to their magnitude or intensity. In some cases where approximate values of losses are reported, it is possible to construct a weighted measure of the magnitude of the shock. The use of labor as insurance may be limited to small shocks due to time-endowment constraints. The same may be true for credit constraints in light of credit limits; more households will be credit-constrained in coping with large shocks versus small shocks.

4.2.3. Estimating labor supply responses to shocks

Before proceeding to the estimation strategy for market hours of work, it is useful to mention the methodological issues that arise in analyzing labor supply in general. In the analysis of female labor supply, Killingsworth and Heckman (1986) pointed out that the simple fact that many women do not work has important implications for empirical work. First, there is a specification problem. Consider the standard labor supply function:

18 Other types of shocks include illness and theft/death of livestock.
(8) \[ h = wa + Xb + Rc + e, \]

where \( h \) is hours of work per period, \( w \) is the real wage, \( R \) is real exogenous income, \( X \) is a vector of other variables, and \( e \) is a random error term. The difficulty in using similar specifications for female labor supply is that it only applies to working women. On the other hand, the labor supply of nonworking women (or whose wage offers do not exceed the reservation wage) will be insensitive to small changes in the market wage, exogenous income, and other variables. Second, even if (8) was correctly specified, it cannot be applied to the entire female population because market wages of nonworking women are not observable.

While the specification and measurement problems may be avoided by fitting (8) to data on working women only, this creates another econometric problem: sample selection bias. Because working women are not representative of the entire female population, least squares regression methods lead to biased estimates of the estimated parameters \( b \). In analyses of family labor supply, a similar bias can arise when labor supply functions for wives are estimated using data restricted to wives whose husbands are employed. Killingsworth and Heckman (1986) note that, in general terms, the solution to these interrelated methodological problems is to estimate both the labor supply function as well as other behavioral functions relevant to work effort (e.g. the participation decision).

**Tobit censored regression**

Recognizing that desired labor supply may well be negative for those whose characteristics do not predispose them to work, the labor supply function takes the general form:

\[ h^*_i = \beta' X_i + \varepsilon_i \]

\[ h_i = h^*_i \text{ if } h^*_i > 0 \]

\[ = 0 \text{ otherwise.} \]

(9)
Women who do not participate in the labor market have actual hours of work truncated at zero. Thus, actual hours worked is equal to desired hours only at positive levels. This is the standard Tobit censored regression. The objective is to estimate the parameters of the function,

\[
\hat{h} = \beta'X_i,
\]

using data on actual hours supplied by participants, as well as information on individuals who choose not to participate. The likelihood that individual \(i\) is not participating is:

\[
\Pr(\hat{h}_i + \varepsilon_i < 0) = F(-\hat{h}_i).
\]

The likelihood that individual \(j\) is supplying positive hours \(h_j\) is:

\[
\Pr(\hat{h}_j + \varepsilon_j = h_j) = f(h_j - \hat{h}_j).
\]

If there are \(I\) nonparticipants and \(J\) participants, the likelihood of observing the set of sample values is:

\[
L = \prod_{i=1}^{I} F(-\hat{h}_i) \prod_{j=1}^{J} f(h_j - \hat{h}_j)
\]

\[
= \prod_{i=1}^{I} F(-\beta'X_i) \prod_{j=1}^{J} f(h_j - \beta'X_j)
\]

Maximizing this likelihood function with respect to the parameters yields parameter estimates. The Tobit method produces unbiased estimates because the problem of negative correlation between \(X\) and \(\varepsilon\) has been avoided. In general, the Tobit method may be used to estimate labor supply whenever corner solutions are significant.

**Estimating market hours of work**

To analyze the labor supply responses to transitory shocks, the relevant variable to be estimated is market hours of work. First-order conditions from the household’s utility
maximization yield market hours of work equations for categories of labor. Because farm households rely primarily on family labor for crop production, corner solutions (i.e. zero market hours of work) are expected to be significant. Thus, market hours of work functions may be estimated using Tobit regressions, where observed hours \((h^m(\cdot))\) equal desired hours \((h^*(\cdot))\) when the latter are positive and zero otherwise. For labor category \(i\) in household \(j\), desired market hours of work equation is given by:

\[
(14) \quad h^*_j = Z^*_j \alpha + \beta_1 \theta^+_j + \beta_2 \theta^-_j + \epsilon^*_j
\]

where \(Z^*_j\) is a vector of variables that explain market hours of work, \(\theta^+_j\) and \(\theta^-_j\) represent positive and negative household income shocks, and \(\epsilon^*_j\) is an error term with mean zero. Standard regressors include production and demographic shift variables,\(^{19}\) village-level variables (e.g. aggregate income, prices), and market wages.

We will also allow for the labor supply response to differ between sugar and corn farmers. This will require adding an equation to model to account for the crop choice decision for those households living “near” the sugar mill.\(^{20}\) This equation, of the form

\[
(15) \quad S^*_i = Z^*_i \delta + v_i,
\]

represents the net benefits from choosing to grow sugar rather than corn. We observe only whether households living close enough to the mill that sugar production is profitable chose to grow some sugar, which can be indicated by a dummy variable \(s_i\) equal

\(^{19}\)The labor supply functions in (3) show that desired hours of work are also functions of own-farm hours of work and hours of work of other labor categories. In the estimating equation, these variables are substituted by market wages and the determinants of the marginal product of own-farm labor.

\(^{20}\) This study will use results from the initial analysis of transportation cost data undertaken by the IFPRI research team. The objective of the cost analysis is to identify the optimal division of the sample into those living “near to” or “far from” the mill, where near means sufficiently close to the mill that sugar production is viable.
to one if \( S_i^t > 0 \) and zero otherwise. The vector \( Z_i \) includes regressors that affect the decision to adopt sugar production.

Equations (14) and (15) will be estimated for each labor category for the entire sample,\(^{21}\) and separately for groups of constrained and unconstrained households. The added worker hypothesis predicts that the coefficient for the negative shock variable will be positive and significant for credit-constrained households.

**Alternative labor variables**

In the long run analysis, market hours of work may not be the appropriate labor variable to study. This is partly due to the design of the shocks module, which asks respondents about significant shocks over the last 20 years. If the household resorted to labor supply adjustments to cope with those shocks, current labor supply may no longer reflect it, especially if shocks are not recent. Instead, variables such as occupational choice or share of labor in household income, may be more appropriate. Migration of family members is likewise a viable labor supply response over the medium and long term. This can be captured as one of the categories under occupational choice. Alternatively, share of transfers in household income conditional on migration may be used.

Using the same approach proposed for the short run analysis, households can be grouped into cohorts that are constrained and unconstrained based on the 1984 data. We can estimate these labor variables as functions of household characteristics and long run shocks and compare parameter estimates for the two groups. We shall use the same technique outlined above to allow the labor response to differ across sugar and corn farmers.

\(^{21}\) The analysis can be performed using aggregate market hours for the entire household, which assumes that labor supply of members behave in the same way, or using aggregate market hours for categories of labor by age and/or gender, to distinguish responses to shocks by labor category. Both analyses can be performed in this research. There are no female-headed households in the 84/85 sample. In general, past studies focus on individual labor supply, whereas Kochar (1999) distinguished labor supply by gender.
Although the occurrence of long run shocks may affect the path of labor supply over the lifetime even for the unconstrained group, the effect on labor choices are expected to be greater for the constrained group, all other things equal.

4.2.4. Other empirical issues

As noted by Quisumbing and Montillo-Burton (2002), two important issues affecting the validity of our estimates must be addressed: (i) life-cycle issues, and (ii) attrition bias.

Life cycle issues

Life cycle considerations affect the timing of labor supply. This is especially relevant in the long run analysis because household members contributing labor income in 2003 were children in 1984. Unless such factors are taken into account, one might erroneously conclude for example, that the share of income from labor increased when in fact the children, who were too young to earn labor income in the past, have joined the labor force. This is effectively an increase in the labor endowment of the household. This issue can be addressed by including demographic control variables and by drawing on information on changes in household structure.

Attrition bias

Biases can be introduced into analyses if sample attrition is not random. This potential problem of selection bias due to non-response is exacerbated in longitudinal data due to the inherent difficulties in interviewing the same individuals multiple times over long periods of time. Attrition in the 2003 sample is roughly 20 percent, which could lead to bias in estimation. Two broad factors contribute to attrition in our sample: (1) death, and (2) failure to trace and re-interview those individuals who are living. We shall test for attrition bias following the technique suggested by Fitzgerald, Gottschalk, and Moffitt (1998). The

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22 This section follows the method suggested by Quisumbing and Montillo-Burton (2002).
relation of interest is estimated using the entire set of first-round information on the right hand side variables, and then include the interactions between the regressors and the attrition indicator as right side variables. The objective is to determine whether those who subsequently leave the sample differ in their initial behavioral relationships. Attrition bias may be present if the interactions are significant.

If attrition bias is found, estimation of a selection-corrected model is possible if there exist regressors correlated with attrition but not correlated with the error term. Quisumbing and Montillo-Burton (2002) note that, to the extent that they are good predictors of attrition, crop choice may prove to be a useful instrument in this setting. If selection is based on observable characteristics, we will need to test whether attrition biases our estimates of the coefficients of interest. The solution proposed by Fitzgerald, Gottschalk, and Moffitt (1998) involves estimating an attrition function using the (endogenous) outcomes in the first period, and then estimating the model of interest by weighted least squares where the weights are constructed from the first stage attrition function.

5. Data requirements and sources

This proposed research project requires data on: household and individual characteristics, farm production, wages and other income sources, assets, consumption, and community variables. Lastly, to determine which households face binding credit constraints, information on unmet credit demand is crucial. In general, labor supply studies require panel data to be able to account for life cycle and other individual-specific effects.\(^{23}\)

\(^{23}\) Maloney (1991) suggested that assortative mating could explain the lack of empirical evidence for the added worker effect. If it exists, this sorting mechanism could result to a bias against finding an added worker effect in a cross-section of data (Cullen and Gruber 1996; Maloney 1991).
Our proposed data set is the 1984-2003 Southern Bukidnon Cash-Cropping Project, conducted jointly by the International Food Policy Research Institute (IFPRI) and the Research Institute for Mindanao Culture (RIMCU), Xavier University. This dataset is composed of two parts: (i) a four-round panel conducted in four-month intervals from 1984 to 85, and (ii) a one-round resurvey of the original households conducted in 2003. To our knowledge, this is the only data set on the Philippines that collects both labor and credit variables.

The 2003 survey is a follow-up to the original Southern Bukidnon Cash-Cropping Project conducted in 1984-85. The objective is to study the long-run welfare implications of credit constraints. Longitudinal cohort methods were used to collect data in 2002-03 from (1) households previously surveyed in 1984/85, and (2) households formed since 1984/85 of children in respondent households who have married and who reside either in the village or in nearby municipalities (“splits”).

Splits refer to new households set up by former members of the original households. The children from original households are included in the panel (although they are now living in separate households), since they have observations in both 1984/85 AND 2003. On the other hand, their spouses and children are not included in the panel.

When analyzing household-level outcomes (e.g. share of wages in household income), splits will not be included. On the other hand, when analyzing individual-level outcomes (e.g. hours worked), children from original households are included.

Sampling of the original households in 1984/85 was conducted using a quasi-experimental design to compare households which had shifted to sugarcane production and those which had not. The survey area was extended beyond the vicinity of the sugar mill to

24 As one of IFPRI’s Philippines-based collaborators, the team leader has been granted access to the 2003 data.
include households that did not have the opportunity to adopt sugar (due to prohibitive transport costs) but shared a common growing environment and cultural heritage with sugarcane-adopting households. Approximately 450 households were surveyed in all four rounds.

The 2003 data are composed of a one-round household survey covering income, expenditures, financial transactions, household resource access and allocation, demographic changes, education, health, nutrition, food consumption, and access to community resources.

6. Dissemination strategy

6.1. Research outputs

It is expected that the research will produce papers for each period of analysis: (a) linking labor supply to transitory income shocks given credit constraints, and (b) linking current labor choices to long run shocks given past credit constraints. Two types of outputs are expected: (1) research-oriented output, suitable for publication in a peer-reviewed journal, and (2) policy briefs, suited for development practitioners and policymaking audiences. The policy briefs will be disseminated in policy seminars discussed below.

6.2. Relationship with the IFPRI research program

This research was not originally part of the IFPRI research program on rural financial markets. Ms. Malapit learned about the IFPRI resurvey in Bukidnon during Dr. Quisumbing’s seminar on credit constraints at the UP School of Economics last August 2003. Ms. Malapit, who was developing her dissertation topic on labor supply and credit constraints, approached Dr. Quisumbing regarding the possibility of using the 2003 survey
data for her thesis. IFPRI’s data release policy allowed access to outsiders but only three years after the project is completed, or upon submission of the final deliverables, whichever is later. However, because none of the IFPRI team members was working on labor supply, they were open to granting Ms. Malapit immediate access to the data provided she perform some work on the project. Currently, Ms. Malapit is a Philippines-based collaborator of IFPRI. Her role in the project includes: (i) supervising the Community Survey in Bukidnon, which involves fielding a community questionnaire and gathering data from secondary sources, (ii) assisting in data cleaning and the creation of analysis files, and (iii) drafting a paper on labor supply and credit constraints using the 2003 data. She was offered 1350 USD honoraria for 105 days of work. The agreement stipulates joint ownership of the research output between IFPRI and Ms. Malapit. As such, this research will be part of the dissemination activities of IFPRI, and its results will be included in the synthesis volume to be published upon completion of the project. The team is fully aware of this research agreement between IFPRI and Ms. Malapit.

The research team has agreed on the following distribution of responsibilities: As team leader, Ms. Malapit will be drafting all the research-oriented outputs for this proposed research project. Mr. Redoblado, an econometrician, will provide technical support on the empirical analysis and will not be drafting any outputs. Mrs. Cabungcal-Dolor will provide research support, and will be drafting policy briefs for the project.

6.3. Outreach to local policymakers

As part of the research program of IFPRI on rural financial markets, this research will be part of the outreach and dissemination activities organized by the collaborating institutions. Among the primary audiences are policymakers and development practitioners
in developing countries (government and civil society), as well as donors who can make decisions on anti-poverty interventions in rural financial markets. In addition to the proposed outreach and dissemination activities to USAID officials, the proposed research program will also include seminars and other dissemination activities targeted to the Philippine academic and policymaking communities, at both national and regional levels, including: the National Economic and Development Authority, the Philippine Institute for Development Studies, the Central Bank of the Philippines, as well as professional economic organizations such as the Philippine Economic Society. These dissemination activities will also include participants from various civil society organizations representing the rural sector. The collaborating Philippine institutions, which include the Research Institute on Mindanao Culture (RIMCU) at Xavier University, the University of the Philippines School of Economics (UPSE), and the Philippine Center for Policy Studies (based at UPSE), will take the lead in organizing these outreach activities. Because IFPRI has undertaken studies on rural finance in a number of developing countries, the results from the Philippine study will be placed in the context of the multi-country study.

The results from this research will also be included in the synthesis volume to be produced by the IFPRI research team at the end of the rural finance project. This book will either be in the IFPRI Research Report series or published by the Johns Hopkins University Press.

7. References


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8. **Prior training and experience of team members in the issues and techniques involved**

Ms. Hazel Malapit is a Ph.D. candidate at the School of Economics at the University of the Philippines, where she also received her M.A. Economics degree in 2001. Her research experience has focused on gender, social policy, poverty and human development. She was a Fellow of the Knowledge Networking Program on Gender and Macroeconomics held last May 2003 at the University of Utah. Through her affiliation with the International Gender and Trade Network (IGTN), she has conducted research on gender, social policy and trade policy. As an economist for the Women and Gender Institute, she conducted research on the gender dimensions of poverty and human development for UNIFEM. She has also conducted research on targeting practices of government anti-poverty programs, and determinants of long-run growth and development. Last year, she led an independent research team to do a preliminary study on violent conflict and chronic poverty in Mindanao.

She recently joined a local non-government organization, Action for Economic Reforms (AER) as a Policy Analyst and Research Associate. She is also among the Philippines-based collaborators of the International Food Policy Research Institute (IFPRI) for the project, “The long-run effects of access to financial services on asset accumulation, economic mobility, and the evolution of well-being: Revisiting agricultural commercialization in Bukidnon, 1984-2003.” Her previous research experience on poverty issues, and her familiarity and access to the 2003 IFPRI dataset, are her primary contributions to the team.
Mr. Jade Redoblado is a researcher and econometrician at the Institute for Development and Econometric Analysis (IDEA). Although he is primarily a statistician by training, having received his graduate and undergraduate education from the Statistics Center at the University of the Philippines, he also has a solid background in theoretical and applied economics. He has served as an econometrics and statistics consultant for many researchers in various fields. Through his exposure and participation in various types of economics research, he is experienced in the use of different modeling approaches, econometric techniques and statistical applications. His expertise in applied econometrics, and his mastery of statistical software are his primary contributions to the team.

Mrs. Deanna Cabungcal-Dolor is a well-trained researcher and economic writer, having written over 200 articles in BusinessWorld, a local business broadsheet. She obtained her B.S. Economics degree from the University of the Philippines School of Economics in 1999. Her research experience includes labor and poverty issues using public-use national labor force surveys and household surveys. Mrs. Dolor will provide research support, and will be responsible for drafting the policy briefs.

9. **Expected capacity building for researchers and their institutions.**

The team is composed of young, well-trained researchers who are expected to gain valuable experience from this project. Although the general topic is not entirely new for the team members, their research in the past has focused on macro-level public-use data. As this will be the first time the team will be using micro-level field survey data, they are expected to gain proficiency in the techniques for handling this type of dataset. The members of the research team are expected to learn significantly from each other’s complementary experience and expertise.
This proposed research was originally intended to comprise one of the essays in Ms. Malapit’s Ph.D. dissertation. However, due to financial constraints, Ms. Malapit has decided to postpone pursuing her degree in the meantime, and will instead focus on conducting research and teaching.

10. Any ethical, social, gender or environmental issues or risks which should be noted

Although this research focuses on the study of market labor supply in general, some gender-related implications are expected. Past studies on hours of work responses to idiosyncratic income shocks in India have shown that it is the male household members who perform the insurance function (Kochar 1995, 1999). This may be due to gaps in market wages, where males are more valuable in the labor market, while females face greater opportunity costs because of their duties at home. If our results support these earlier findings, female-dominated households who are unable to rely on labor as insurance, may be among the most vulnerable groups in these communities.

11. List of past, current or pending projects in related areas involving team members


Ms. Malapit is collaborating with IFPRI for the project, “The long-run effects of access to financial services on asset accumulation, economic mobility, and the evolution of well-being: Revisiting agricultural commercialization in Bukidnon, 1984-2003.” She will assist in conducting the community survey, data cleaning and the creation of analysis files. In addition, she will be conducting research on labor supply. The principal investigators of the project are Dr. Agnes R. Quisumbing (IFPRI) and Dr. Linda Montillo-Burton (RIMCU).
11.2. Past projects

- **Title:** Violent conflict and chronic poverty in Mindanao

  **Funding Institution:** Asia Foundation (Travel grant to the Chronic Poverty Conference, Chronic Poverty Research Centre, University of Manchester, 7-9 April 2003)

  **Research Team Members:** Hazel Jean Malapit (Team leader), UP School of Economics; Tina Clemente, UP School of Economics; Cristina Yunzal, Baruch College and The Graduate Center, City University of New York.

  **Period:** November 2002 to April 2003

- **Title:** Gender assessment of the Philippine development situation

  **Funding Institution/Contractor:** UNIFEM/UNDP

  **Research Team Members:** Gigi Francisco (Team leader), Joel Lasam and Hazel Jean Malapit, Women and Gender Institute (WAGI)

  **Period:** May 2002 to September 2002

12. APPENDIX 1: Summary of credit data, 1984/85

The following is a brief summary of the credit data from the sugar and corn producer’s questionnaires (the two major crops) and from the other sources of income questionnaire.

**Sugar Producers’ Questionnaire**

Out of 448 households in the 1984/85 sample, 102 grew some sugar. Of these, 62 households (61%) borrowed cash for sugar production in at least one round. Another 7 households borrowed inputs (in-kind) directly. See Table 1 for a summary of loans by round.
For each loan, there is coded data on the source of the loan, type and amount of collateral, terms of repayment, and use of the loan. Between 25 and 35 percent of sugar farmers claimed to be quantity constrained in production credit. Respondents who claimed to be quantity constrained were asked how additional credit would be used. Sixty-four percent of farmers sought additional financing for the purchase of fertilizer. A related question asks why more credit is not used; high interest rates and difficulties meeting repayments are among the most common responses. Households not using credit were asked why; responses for round 4 are provided in Table 2.

Table 1: Loans for Sugar Production, By Survey Round

<table>
<thead>
<tr>
<th></th>
<th>Round 2</th>
<th>Round 3</th>
<th>Round 4</th>
<th>Total/All</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. sugar producing HHs</td>
<td>102</td>
<td>102</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>No. HHs borrowing cash</td>
<td>36</td>
<td>24</td>
<td>25</td>
<td>85</td>
</tr>
<tr>
<td>No. HHs borrowing inputs</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Median nominal loan size (pesos)</td>
<td>1500</td>
<td>2000</td>
<td>3000</td>
<td>2000</td>
</tr>
<tr>
<td>Use more prod credit if avail? No</td>
<td>72</td>
<td>63</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>24</td>
<td>34</td>
<td>26</td>
</tr>
</tbody>
</table>

Table 2: Reasons for Not Borrowing

<table>
<thead>
<tr>
<th>Why don’t you get production credit?</th>
<th>Freq.</th>
<th>Percent</th>
<th>Cum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid at paying time</td>
<td>14</td>
<td>15.05</td>
<td>15.05</td>
</tr>
<tr>
<td>Have sufficient funds</td>
<td>10</td>
<td>10.75</td>
<td>25.81</td>
</tr>
<tr>
<td>Afraid can’t pay back</td>
<td>9</td>
<td>9.68</td>
<td>35.48</td>
</tr>
<tr>
<td>Interest too high</td>
<td>9</td>
<td>9.68</td>
<td>45.16</td>
</tr>
<tr>
<td>Only family labor</td>
<td>5</td>
<td>5.38</td>
<td>50.54</td>
</tr>
<tr>
<td>Have credit in bank</td>
<td>6</td>
<td>6.45</td>
<td>56.99</td>
</tr>
<tr>
<td>Small production only</td>
<td>7</td>
<td>7.53</td>
<td>64.52</td>
</tr>
<tr>
<td>Land owner pays exp</td>
<td>2</td>
<td>2.15</td>
<td>66.67</td>
</tr>
<tr>
<td>N/A</td>
<td>31</td>
<td>33.33</td>
<td>100.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>93</strong></td>
<td><strong>100.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Corn Producers’ Questionnaire**

Summary statistics for corn producers from rounds 3 and 4 of the survey are provided in Table 3. Out of 368 farmers that grew corn in at least one round, 117 (32%)
took either a cash or in-kind loan. In-kind input loans were a more important source of credit for corn farmers than sugar farmers, which is consistent with the commercialized nature of the sugar crop. Farmers claiming to be quantity constrained in credit access represented 31 percent and 38 percent of corn farmers in rounds 3 and 4, respectively. Tables 4-6 summarize the source of cash loans and some information on the nature of credit constraints for corn producers in these two survey rounds.

Table 3: Loans for Corn Production, by survey round

<table>
<thead>
<tr>
<th></th>
<th>Round 3</th>
<th>Round 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. corn producing HHs</td>
<td>315</td>
<td>333</td>
</tr>
<tr>
<td>No. HHs borrowing cash</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>No. HHs borrowing inputs*</td>
<td>37</td>
<td>75</td>
</tr>
<tr>
<td>Median nominal loan size (pesos)</td>
<td>500</td>
<td>484</td>
</tr>
<tr>
<td>Use more prod credit if avail? No</td>
<td>216</td>
<td>208</td>
</tr>
<tr>
<td>Yes</td>
<td>99</td>
<td>125</td>
</tr>
<tr>
<td>Obligated to sell corn to lender? No</td>
<td>97</td>
<td>124</td>
</tr>
<tr>
<td>Yes</td>
<td>34</td>
<td>82</td>
</tr>
</tbody>
</table>

*All input loans in round 4 were loans of fertilizer.

Table 4: Source of Cash Loans

<table>
<thead>
<tr>
<th>LOAN 1</th>
<th>Round 3</th>
<th>Round 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>SUKI (regular source)</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>NEIGHBOR</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>RELATIVES</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>FRIEND</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>LANDLORD</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>BANK</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>33</td>
</tr>
</tbody>
</table>
Table 5: Source of Unmet Demand for Credit

<table>
<thead>
<tr>
<th>HOW WOULD MORE CREDIT HAVE BEEN USED?</th>
<th>Round 3</th>
<th>Round 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO BUY FERTILIZER</td>
<td>41</td>
<td>69</td>
</tr>
<tr>
<td>FOR FARM EXPENSES</td>
<td>49</td>
<td>44</td>
</tr>
<tr>
<td>TO BUY FOOD/FOR FAMILY EXPENSES</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>TO BUY FARMLOT/LAND</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>TO BUY A PIECE OF LAND AND ANIMALS</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>NOT APPLICABLE</td>
<td>232</td>
<td>221</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>337</td>
<td>345</td>
</tr>
</tbody>
</table>

Table 6: Reasons for Being Credit Constrained

<table>
<thead>
<tr>
<th>REASON WHY CANNOT GET MORE CREDIT</th>
<th>Round 3</th>
<th>Round 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOT NECESSARY</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HARD TO PAY DEBTS, TOO MUCH HASSLE</td>
<td>102</td>
<td>99</td>
</tr>
<tr>
<td>HIGH INTEREST RATE</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>STILL HAVE PREVIOUS DEBTS</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>SMALL HARVEST, SMALL PIECE OF LAND</td>
<td>39</td>
<td>43</td>
</tr>
<tr>
<td>DID NOT OWN LAND</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>FAMILY CAN MANAGE ON OWN</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>STILL HAVE ENOUGH CASH ON HAND</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>WE WILL BE FORCED TO SELL HARVEST</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>NO RESPONSE</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>NOT APPLICABLE</td>
<td>130</td>
<td>138</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>337</td>
<td>345</td>
</tr>
</tbody>
</table>

**Other Sources of Income (Non-production Credit)**

This section of the questionnaire has both borrowing and lending information. In the borrowing data, there are 389 loans taken by 240 households. Although these are not supposed to be production loans, 20 percent of the loans were taken to buy land, and nearly 5 percent were used to buy fertilizer. The median loan size was 700 pesos, while the mean was 4461 pesos. Other variables collected for these loans include year borrowed, original principal amount, type of collateral, and terms of borrowing and repayment. In the lending data, 116 of the sample households made 166 loans, with a median size of 500 pesos.