Effects of Changes in Income on Changes in Consumption: An Empirical Investigation for Illinois Farm Households

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Abstract

Using repeated cross section data, this study identifies how changes in income (defined over different ranges of income change) affect changes of farm household consumption. OLS regression confirms that the number of members within a farm household positively affects changes of consumption at the 1% significance level, and households with children compared to childless households are recognized to have lower change of consumption at the 5% significance level. In addition, households that experience income increases of more than 50% have higher changes of consumption compared to households who face an income decrease of more than 50% at the 1% significance level. However, no significant change of consumption is found for households with income changes between -50% and +50%. These results are not robust when a smaller dataset is considered. This research is significant because few previous studies have tried determining relevant income change ranges, at which consumption changes significantly with income. The results of the study might be further analyzed to help creditors to decide the typical cash flow demands from farm expenditures and consumption, as well as which farmers are in most need of loans.

Key Words: repeated cross section, OLS, changes in household consumption, changes in household income, ranges of income changes.

I. Introduction

Farm income fluctuations resulting from variations in weather patterns, commodity prices, or productivity of farm land can typically change the consumption pattern of developing country farm households (Morduch, 1995 and Becker, 2006). However, it is conceivable that farm income variations change U.S. farm household consumption patterns as well. Since farmers set their lifetime consumption levels based on their expected lifetime incomes, to maintain this level of consumption, they must either consume from saved income or find alternative sources of income (Deaton, 1997). During farm profitability shortfalls, farmers may increase borrowing, liquidate assets, or work off the farm in order to maintain desired consumption levels[1]. Changes in income (positive or negative) can most likely produce significant changes (positive or negative) in consumption when farmers do not possess sufficient collateral or experience seasonal difficulty in obtaining credit. Furthermore, there may be a relevant range of income changes that produces significant consumption changes although other ranges of income changes have no systematic relation to consumption. If such a range of income change exists and can be estimated, then it will help explain the consumption behavior of Illinois farmers.

The major objective of this study is to investigate how changes in farm household income affect farm household consumption. Specifically, this study is interested in 1) finding if there is a particular range of income change at which income changes significantly affect farm household consumption patterns and 2) verifying the linkage between demographic variables and change in farm household consumption. To achieve these objectives, descriptive analyses are performed. The results obtained from descriptive analysis are examined in a multivariate framework by

[1] The life cycle / permanent income hypothesis (LCPIH) is one of the major constructs that has been used to explain consumption smoothing. The LCPIH dictates that households make their consumption decisions based on their expectations of total lifetime income. Thus, although a household's income may vary, it does not affect consumption decisions of the household as long as income variability does not affect long-run average income or permanent income of the household (Langemeier and Patrick, 1993).

running OLS regression[2]. Descriptive analysis and OLS regression are based on an empirical model, which is defined by the life cycle / permanent income hypothesis (LCPIH). Data from the Illinois Farm Business Farm Management (FBFM) Association from 1995 to 2005 are used for the empirical exercise since this is the most current data available.

This paper makes a significant contribution to the literature on farmer consumption patterns because it uses a unique and rich dataset of consumption and farm income measures. Furthermore, in contrast to previous studies of farm households, an effort is made to identify and quantify the effect of income change on changes of consumption. In addition, few studies have focused on trying to determine the ranges of income change at which consumption patterns of farmers change significantly when income changes. A knowledge of these relevant income ranges might help creditors to decide the typical cash flow demands from farm expenditures and consumption, as well as which farmers are in most need of loans.

The importance of understanding the effects of changes in household income levels on consumption levels is going to increase with the reauthorization of the 2002 Farm Bill in 2007[3]. This is because new farm bill legislation might negatively impact farm household income levels. It is possible that the fixed payments provided to farm households will be reduced or eliminated because of the Deficit Reduction Act of 2005 and because current farm income is high compared

[2] Next step can be to do a more sophisticated econometric model, including correcting for endogeneity bias due to omission of relevant variables. Specifically, although the education variable is not included as a regressor, education is correlated with both income and consumption. OLS estimation that ignores this correlation is biased.

[3] Since it is harder for farmers compared to non-farmers to adjust their production to market signals, markets do not efficiently meet supply with demand. For instance, in the short-run when prices are low, farmers cannot increase their production immediately. They can only adjust their capacity in the long-run. To help farmers, federal support began in the 1930s (Hull, 2006). The 2002 Farm Bill was significant because it improved the financial position of farmers. Its purpose was to expand farm conservation and rural development programs, as well as to stabilize and support farm income through direct payments, counter-cyclical payments and providing loans and loan deficiency payments. Direct payments are fixed amounts paid to farm households independent of current production or current market prices. On the other hand, counter-cyclical payments are provided to farmers when market prices are below the determined target prices. The loan and loan deficiency payments are aimed to give farmers short-term funds so that they can pay their expenses until their commodities are sold. This loan program encourages farmers to sell their crops based on price signals rather than creditor pressure (Monke, 2006).

to the income of non-farmers[4]. These fixed payments may be transferred into counter-cyclical payments, changing the income levels of farm households. Therefore, it is important to understand how changes in income levels of farm households affect their consumption, particularly if farm incomes fall in those ranges of income change where consumption changes significantly.

The results from this study have important implications for farm financial analysts, farm financial modeling and agricultural policy. Understanding the drivers of farm consumption and relationships to farm income provides analysts with stronger empirical evidence of saving, investment behavior and changes in net worth of farm households. The change in net worth from one year to the next is influenced by net income and consumption of the farm household. Reductions in income of a magnitude greater than decreases in consumption or increases in consumption of a magnitude larger than income increases signal that the overall financial position of the farm household is weakened. Banks can use this information to asses the riskiness of the particular farm household[5]. As the financial condition of the farm household weakens, agricultural lenders perceive more risk, interest rates for debt will increase, and the availability of credit based on credit type will decline[6]. For instance, most likely, the availability of credit for capital and real estate financing will decrease, while the availability of operating credit will be less affected given its importance to the survival of farms (Barry et al., 1981). As a result, farm

[4] For instance, the Deficit Reduction Act of 2005 aims to achieve a five-year net savings of approximately $2.7 billion on the mandatory commodity, conservation, rural development and research programs for farmers (Becker, 2006).

[5] Change in net worth = Net Farm Income + Non-Farm Income – (Living Expenses, Tax Payments or Other Consumption) (Edwards, 2004).
By using results of this study, one can predict how a change in farm household's income today affects its future consumption. With projected income statements and consumption levels of farm household, one can get an idea of how farm household's net worth is expected to change for next year. This may be useful for creditors, especially because changes in net worth affect overall financial condition of farm household and thus, farm household's perceived riskiness by the creditors.

[6] The types of credit available for a farm household include capital credit, real estate credit and operating credit. Capital credit is the credit given for machinery/equipment investments. Real estate credit is provided for building and land purchases. Operating credit refers to the credit supplied to finance farm operating activities.

household investments may decline, and the farm household may need to put forth larger down payments or secure shorter term loans. Thus, by obtaining more information regarding the consumption patterns of farm households, farm financial analysts can better evaluate the riskiness of farm households and design more efficient financial models.

Furthermore, simulation modeling of alternative policies is a common method to investigate the impacts of alternative policies on the well-being of farm households. An important parameter in these models is the relationship of farm income and farm consumption, so a better understanding of the relationship between income and consumption will be useful in such simulations. Moreover, understanding the other drivers of farm consumption levels is critical in forecasting farm consumption levels for various types of farm businesses.

II. Literature Review

The relevant literature focuses on exploring factors that explain household consumption behavior. Most of the studies explore the impact of household income as well as income instability on household consumption patterns. A study by Shim (1991) concentrates on the effects of consumer debt on consumption behavior, and finds that households who have more debt are willing to spend more on consumption compared to households with a lower debt level. The reasoning they provide is that consumer debt may reduce the household budget and reduce the household's control over certain consumption categories; thus, consumption may still be higher than expected. For instance, if a household has automobile debt, it has less flexibility to reduce transportation costs. Therefore, it will focus on reducing expenditures that are more flexible, such as consumption of food at home, and yet the consumption of the household may be higher than that of households who do not use debt.

Research by Wilcox (1989) suggests that consumption expenditures of non-farm workers are reduced by higher nominal interest rates and a higher unemployment rate. According to Wilcox, lenders follow a process where they extend financing to consumers whose payment-to-income ratios are below a specified ceiling level. With inflation, nominal interest rates rise. Since lending parameters, such as the payment-to-income ratio, adjust slowly, more households face interest rate restrictions. However, if payment-to-income ceilings rise or fall with inflation, liquidity constraints will be less tight and have a smaller impact on the consumption patterns of non-farm workers. In contrast to the aforementioned results, he finds that real interest rates have little effect on the consumption patterns of non-farm workers.

Girao et al. (1974) analyze the effects of income instability on consumption and investment for 50 southern Minnesota farmers from 1963-1969. They conclude that income instability has little effect on consumption behavior.

Consumption patterns of households indirectly influence firm production decisions because firms acquire financing when farm households invest in the firms instead of increasing consumption. For example, by curtailing expenditures on expensive vacation trips and instead buying shares from the firms, farm families inject liquidity into firm operations. This is clearly a good reason why both firms and researchers might be interested in estimating the marginal propensity to consume of farm families. Langemeier and Patrick (1990) use four consumption models to examine the marginal propensity to consume for a sample of Illinois farms over the 1979-1986 time frame. They find that changes in income have little effect on farm family consumption. Another study by Langemeier and Patrick (1993) investigated whether farm families are liquidity constrained by using data from 1976 to 1990 for Illinois and Kansas farms. They observe that in contrast to wage earners or non-farm families, farm families' consumption behaviors are not liquidity constrained, since farm families have easier access to other sources of

funds. For instance, due to seasonality, a farm family with good collateral or equity position may borrow in a low income year and repay debt in a high income year. Furthermore, it is easier for farm families to postpone investment in low income years.

Based on previous literature, LCPIH is empirically valid for farmers, whereas it is not valid for non-farm workers. The rationale is that farmers are less liquidity constrained compared to non-farm workers. This paper specifically contributes to the literature by using recent data to analyze whether there is a particular range of income changes at which income changes significantly affect farm household consumption patterns.

III. Model Specification

Following Hall (1978) and Deaton (1997), household i maximizes its expected utility function (1) subject to its budget constraint (2):

(1) Max $E_t \sum_{p=t}^{T} v_{i,\,p}(c_{i,\,p}, Z_{i,\,p})$,

subject to

(2) $A_{i,\,t+1} = (1+r_{i,\,t+1})\,(A_{i,\,t} + y_{i,\,t} - c_i, t)$,

$c_{i,\,t} \geq 0$, and

$A_{i,\,T} \geq 0$

under the following assumptions:

i) Capital markets are perfect, ii) consumers have rational expectations, and iii) permanent income determines household consumption,

where:

E_t = expectation conditional on all information available in time period t,

$v_{i,\,p}$ = utility function for household i in time period p,

t = time,

T = length of economic life of household,

$c_{i,\,t}$ = consumption in time period t for household i,

$A_{i,\,t}$ = assets at time period t for household i,

$Z_{i,\,p}$ = household characteristics in time period p for household i,

$r_{i,\,t+1}$ = constant rate of return for household i from time period t to t+1 and

$y_{i,\,t}$ = earnings in time period t for household i.

Following Deaton (1997), the above maximization problem can be written as a dynamic optimization problem for household i, i = 1, ---, n as in equation (3):

(3) $\text{Max } V_t(A_t, Z_t) = \text{Max } \{v_t((A_t + y_t - w), Z_t) + E_t\, V_{t+1}[((1+r_{t+1})\, w), Z_{t+1}]\}$,

where:

V_t = value of the program at time t and

w = savings that are carried over from period t to t+1 for future consumption.

Since $c_t = A_t + y_t - w$, differentiating equation (3) with respect to A_t yields:

(4) $V'_t(A_t, Z_t) = v'_t(c_t, Z_t) = \mu_t(c_t, Z_t)$,

where:

μ_t = marginal utility of consumption in period t.

Differentiating equation (3) with respect to w generates:

(5) $v'_t(c_t, Z_t) = E_t[(1+r_{t+1})\, V'_{t+1}(A_{t+1}, Z_{t+1})]$.

Substituting (4) into (5) yields:

(6) $\mu_t(c_t, Z_t) = E_t[(1+r_{t+1})\, \mu_{t+1}(c_{t+1,}\, Z_{t+1})]$.

Equation (6) is the Euler equation of the life cycle / permanent income hypothesis optimization problem. The interpretation is that the marginal rate of substitution in any two periods should be indicative of the relative opportunity costs of funds in the relevant periods. By

placing necessary assumptions on the functional form of the utility function, the Euler equations can be made to be consistent with the permanent income hypothesis and the simplest form of the life cycle model. Specifically, suppose the sub-utility function in each period is identical up to a discount factor. Then:

(7) $v'_t(c_t, Z_t) = v'(c_t, Z_t) / (1+\delta)^t$.

Note that the sub-utility function is now constant through time and δ is the rate of time preference. Suppose further that a constant interest rate, r, is assumed and recalling that $\mu(c, Z)$ is the derivative of $v(c, Z)$ with respect to c, (6) takes on the characteristic form in (8a and 8b) below:

(8a) $\mu(c_t, Z_t) / (1+\delta)^t = E_t[((1+r)/(1+\delta)^{t+1}) * \mu(c_{t+1}, Z_{t+1})]$ and

(8b) $\mu(c_t, Z_t) = (1+r)/(1+\delta) E_t \mu(c_{t+1}, Z_{t+1})$ or $\mu(c_t, Z_t) = [(1+r)/(1+\delta)]^k E_t \mu(c_{t+k}, Z_{t+k})$. By making two final assumptions:

(i) $\delta = r$ and (ii) v_t is quadratic so that μ_t is linear, then (8b) implies (9):

(9) $c_t(c_t, Z_t) = E_t(c_{t+1}, Z_{t+1})$.

According to (9), consumption is a martingale. (9) can also be written as

(10) $c_{t+1}(c_{t+1}, Z_{t+1}) = c_t(c_t, Z_t) + \varepsilon_{t+1}$, where ε_{t+1} is a random shock with zero expectation at time t. (10) identifies the classic random property of consumption due to Hall (1978).

(10) is very restrictive in that it imposes homogeneity on household structure, assumes time invariant interest rates and precludes precautionary savings behavior (precautionary savings requires that the third derivative of the sub-utility function is positive). Despite their restrictive nature, the combinations of these assumptions and the initial premise that consumers are not credit-constrained, provides justification for using consumption smoothing models. Clearly, the age profile of consumption is dependent on tastes, household characteristics, and the relationship between the interest rate and the rate of time preference in the case where $\delta = r$ is not assumed.

The permanent income hypothesis (PIH) interpretation is that not only is consumption constant, but that it is equal to a constant fraction of permanent (Y^p), not temporary income (Y^t). Consumption is therefore a function of permanent income and demographics as in (11), but β_2 must be necessarily zero.

(11) $C_{i, t+1} = \beta_0 + \beta_1 Y^p_{i, t+1} + \beta_2 Y^t_{i, t+1} + \beta_3 Z_{i, t+1} + e_{i, t+1.}$

The estimation (11) requires additional assumptions about what temporary and permanent income are. If $Y = Y^p + Y^t$, then equation (11) can be written as:

(12) $C_{i, t+1} = \beta_0 + \beta_1 Y_{i, t+1} + \beta_3 Z_{i, t+1} + (\beta_2 - \beta_1) Y^t_{i, t+1} + e_{i, t+1}.$

If the term in regards to temporary income is absorbed in the error term, then this equation can be estimated as in Deaton (1997) with an instrumental variable that is correlated with permanent income (Y^p) but that is orthogonal to temporary income (Y^t). One instrument used in past studies is the lagged income[7]. So, the model becomes:

(13) $C_{i, t+1} = \beta_0 + \beta_1 Y_{i, t} + \beta_3 Z_{i, t+1} + error_{i, t+1}.$

Recall that even though this study is motivated by the life cycle / permanent income hypothesis, its aim is neither to differentiate between the effects of temporary and permanent income on farm household consumption behavior nor to validate the LCPIH. The principal purpose of this research is to determine if there is a range of income change at which further changes in income affect consumption patterns of farm households. To that end, (13) is first differenced to give (14).

(14) $\Delta C_{i, t+1} = \theta_0 + \theta_1 \Delta Y_{i, t} + \theta_2 Z_{i, t+1} + e_{i, t+1},$

Note that demographic variable was not first differenced since first differencing causes the demographic variables to disappear. The basic empirical formulation is therefore given by:

[7] Lagged income might not be a valid instrument if consumption is directly affected by both current and lagged income or if current temporary income is affected by lagged temporary income.

$$(15)\ \Delta C_{i,\,t+1} = \alpha_0 + \alpha_1 \Delta Y_{i,\,t} + \alpha_2 K_{i,\,t+1} + \alpha_3 Z_{i,\,t+1} + \sum_{z=1}^{z=5} \alpha_z D_{z,\,i} + e_{i,\,t+1},$$

for i = 1, ----, n, where current household debt ratio and dummy variables are also included in the model[8]. It is expected that household debt levels will affect changes in household consumption, a conclusion also reached by Shim (1991). To illustrate, a household that faces an income decrease is still expected to pay its debt through additional borrowing or cutting back on its consumption. If the household chooses additional borrowing, household can pay its debt and at the same time can increase its consumption or keep its consumption steady. Thus, this model also looks at the effect of household debt ratio on change of household consumption. The notations used in (15) are explained as,

$\Delta C_{i,\,t+1}$ = changes in consumption level of household i. This change is based on:

$(C_{i,\,t+1}) - \{[(C_{i,\,t}) + (C_{i,\,t-1}) + (C_{i,\,t-2})]/3\}$, where $C_{i,\,t+1}$ is the consumption of household i in time period t+1,

$\Delta Y_{i,\,t}$ = changes in income level of household i. This change is based on:

$(Y_{i,\,t}) - \{[(Y_{i,\,t-1}) + (Y_{i,\,t-2}) + (Y_{i,\,t-3})]/3\}$, where $Y_{i,\,t}$ is net income of household i in time period t,

$K_{i,\,t+1}$ = debt ratio of household i in time period t+1[9],

$Z_{i,\,t+1}$ = demographic features of household i at time t+1. These include number of household members, operator's age, and owned farm size,

$D_{1,\,i,\,m}$ = dummy variables to capture effects for different ranges of income changes. For example, suppose income changes by 50%. Then: $D_{1,i,\,1} = 1$ if income increases more than 50% and 0 otherwise, $D_{1,i,\,2} = 1$ if income increases less than or equal to 50% and 0 otherwise, $D_{1,i,\,3} = 1$ if

[8] The correlation matrix (not reported) for the model in this study shows no high correlation among the explanatory variables.

[9] When changes in debt ratio is used as a variable rather than debt ratio, the regression results stay the same except changes in debt ratio also become significant in explaining changes in consumption. The effects of changes in debt ratio over changes in household consumption can be further analyzed in the future.

income decreases less than 50% and 0 otherwise. Note that income decreases of more than or equal to 50% is the reference point for the study[10],

$D_{2, i, m}$ = dummy variables for time to control for factors that are common across farm households but change over time. The value of m ranges from 2004 to 1999. Note that 2005 is the reference year for the study,

$D_{3, i, m}$ = dummy variables for region the farm household is located to control for differences within regions. The value of m refers to Northern and Central Illinois. Note that Southern Illinois is the reference region for the study,

$D_{4, i}$ = dummy variable to control for the financial health of household. If a household has income above average income, then $D_{4, i} = 1$ and 0 otherwise,

$D_{5, i}$ = dummy variable to reflect whether a household has children or not. If a household has children, then $D_{5, i} = 1$ and 0 otherwise.

To reiterate, unlike Langemeier and Patrick (1993), no attempt is made to either validate or disprove the LCPIH. Recall that changes in consumption (which is measured by changes in family living expenses within FBFM data) is the dependent variable in the model. Income changes, household debt ratio and demographic characteristics are the independent variables that explain how changes in income affect changes in consumption levels of households[11]. Table 1 contains the variable definitions as well as their expected signs[12].

Independent Variables:

[10] When dummies for ranges of income changes are used in the regression, income change variable is not included within the model to prevent collinearity since the dummies are obtained through income change definition. Furthermore, 50% is just an arbitrary choice. When different percent levels are tried, results stay the same. However, the category representing no change is not used as a reference since it has very few observations.

[11] The measurements used for consumption and income are evaluated in absolute values, rather than in ratios since changes for these values are used in the model. Furthermore, household demographics do not depend on farm size. However, since debt level may change from one household to another, a ratio measure is used for debt measure.

[12] Even if income and consumption variables are deflated by the version of CPI based on all urban consumers and U.S city average which are obtained from Bureau Labor Statistics, the results for descriptive analysis do not change much.

1. Changes in Income:

The life cycle / permanent income hypothesis stipulates that changes in temporary income have no effect on household consumption levels. Households may use other sources of funds to smooth consumption, but it is only changes in permanent income that can change the level of consumption. However, this study does not focus on differentiating between permanent and temporary income changes. Therefore, changes in farm household income might occur because of a change in permanent or temporary income or both. For instance, a 10% increase in farm household income might be due to an increase in household temporary income. In that case, no effect on consumption is expected based on LCPIH. If some of the increase in household income is due to an increase in permanent income, then a positive relation is expected between income and consumption changes. In other words, either a positive or no effect is expected between changes in income and consumption.

To estimate changes in income using FBFM data, a three-year average (equal weighted average in periods t-1, t-2, and t-3) of net household income is subtracted from net household income in period t[13]. The equal weighted average of net household income in periods t-1, t-2 and t-3 might be considered as household permanent income or expected income. Recall that once the three-year average (equal weighted average in periods t-1, t-2, and t-3) of net household income is subtracted from net household income in period t, changes in household income are observed, which might be due to changes in permanent income, temporary income or both.

2. Debt Ratio:

[13] Net Income = Net Farm Income + Non-Farm Income
Also, three-year averages are used since in application generally three to five years of averages are preferred. Since, using five years of averages will cause more data loss, three-year averages are preferred over five-year averages for this study.

According to LCPIH, households can borrow in times of low income to smooth their consumption and it is only through changes in permanent income that consumption change occurs. However, it is expected that debt levels affect changes in household consumption. A household is expected to reduce its consumption expenditures and adjust its budget allocation among consumption categories (Shim, 1991). For instance, a household with a high fixed debt obligation is expected to pay its debt if there is a considerable increase in income; thus, consumption may stay the same or increase by less than the increase in income. However, if the same household faces a decrease in income, then it is still obliged to pay its debt but it may still maintain, increase its consumption through borrowing or cut back on its consumption. However, after a household has accumulated lots of debt, they may no longer be able to borrow due to credit risk and therefore they may need to decrease their consumption to pay existing debts. It is therefore worthwhile to analyze the effect of debt on changes in household consumption. To capture the nonlinear effect of debt, the debt ratio and debt ratio^2 are used in the model[14]. To estimate the debt ratio, the total liabilities / total assets measurement in the FBFM data is used. Thus, the sign is ambiguous *ex ante*. Positive and negative relations are both possible between the change of household consumption and the household debt ratio.

Demographic variables:

Unfortunately, most of the demographic data included as explanatory variables in consumption equations are often highly correlated with income, raising concerns about multicollinearity (Musgrove, 1978 and Musgrove, 1979)[15]. For the study, it is addressed that

[14] Since a household borrows additional funds when it does not have enough income to pay its current debt, and this borrowing behavior affects its consumption level at the current period, this model considers the debt ratio at current period which is reflected by period t+1.

[15] For example, age, education, region and household demographics might be significant in explaining labor income, as well as consumption behavior (Miles, 1997). To illustrate, net household income might likely decrease if the household has children compared to a household who do not have since children are costly in terms of education and

income change, which is a function of levels of income, is not perfectly correlated with these demographic variables[16]. Also, note that no endogeneity problem arises since the demographic variables are not likely to be correlated with the error term[17].

Since the FBFM dataset contains only variables such as age of oldest child, age of farm operator, household size, farmland tenure, and region farm household is located in, only the effects of these demographic variables on consumption change are analyzed.

3. Size of household:

As a household's size increases, its demand for goods and services increases. This change in consumption demand can be met by either the head of the household working more hours or by other household members getting into farm or non-farm businesses and contributing to household income. Therefore, changes in household consumption and income are expected. Size of the household is measured by the "number of household members" variable in the FBFM dataset. A positive relation is expected between changes in household consumption and the number of household members.

4. Age of the household head:

Age of the household head captures the change in consumption habits of the head of household. For example, when the household head is younger and single, he or she might consume less, thus change in consumption level will be low. On the other hand, as he/she ages and acquires a spouse and children, his/her consumption will increase; thus, the change in consumption levels will be high. Age and age squared are therefore included as explanatory

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food expenditure. Furthermore, the level of education in the household might determine a household's income, as well as food preferences, choices regarding health care practices, entertainment and levels of consumption.

[16] The correlation matrix (not reported) for the model in this study shows no high correlation between demographic variables and income change and is available upon request.

[17] Pragmatically, a potential source of endogeneity may arise due to the exclusion of education from the set of explanatory variables. However, the FBFM dataset has no education variable and no feasible instrument to replace for the education variable. This is an obvious limitation of the research that must be corrected in future work with a richer dataset.

variables to capture a possible non-linear relationship between age and changes in consumption. Positive and a negative signs are expected for the age and age squared variables, respectively. The interpretation is that after increasing up to a point, the change in consumption of the household will start to decrease as the household head ages to the point where all the children leave the house. Age of the household head is calculated by using the "date of operator's birth" variable, which is available in the FBFM data.

5. Whether a household has children:

When a household has children, their consumption needs and habits change depending on the needs of the children. For instance, the household needs to spend additional money on feeding children, their education and social needs. Therefore, changes in consumption level are expected to be higher when a household has children. This is particularly true when a household transitions from having no children to having children since it will increase the living expenses. However, it is also most probable that once a household has children, they might plan ahead for the needs of children and therefore keep their consumption steady. This might result in a smaller change of consumption. Thus, it is important to include this variable to see whether having children has any significance over the changes in consumption levels of households. Within FBFM data, if age of oldest child is 0, the household is assumed to have no children, whereas if age of oldest child is greater than 0, the household is assumed to have children. Due to reasons mentioned above, a positive or a negative relation between having a child and changes in consumption level is expected[18].

6. Farmland tenure:

[18] The dataset contains age of the oldest child variable. However, age of the oldest child variable contains value 0 which refers to a childless household for the dummy representing whether a household has children or not. To prevent collinearity between the dummy representing whether a household has children or not, and age of the oldest child variable, age of the oldest child variable is omitted.

Knowing whether a farm household owns or leases the land might be important when trying to understand household consumption behavior because the household's perception of income changes its consumption behavior. In the case where the household leases the majority of tillable acres, the household might perceive more fluctuations in its income and prefer to avoid changing its consumption, whereas if it owns most of its farmland, the household might be more flexible in modifying its consumption behavior. This flexibility might be due to the fact that a land owner is less likely to be credit constrained since the land can be used as collateral. As a proxy for farmland tenure variable, "owned acres / (owned acres + shared rent acres + cash rent acres)" is used to understand the tenure position. Thus, a positive relation is expected between changes in consumption and owning farmland. Due to data limitations, the effect of whether land owners with and without mortgages have different attitudes towards changing their consumption levels cannot be examined. According to Paulin and Ferraro (1996), changes in consumption levels occur among owners with and without mortgages. However, this distinction can be further investigated in another study.

7. Region farm household is located:

Cost of living varies between each of the different regions of Illinois i.e. Northern, Central, and Southern and is highest in Northern Illinois. Central Illinois is in turn more expensive compared to Southern Illinois. To illustrate, the average price of most goods are highest in Northern Illinois and real estate is cheapest in Southern Illinois (Illinois Association of Realtors, 2005 market statistics). To capture effects of different cost of living on changes in consumption, dummy variables are defined for the region each household is located in. Southern Illinois is the base region for the dummy variables. We expect to see positive signs for both Northern and Central Illinois.

IV. Data and Descriptive Statistics

The empirical analysis uses data from the Illinois FBFM Association to investigate how changes in farm household income affect changes in farm household consumption. Only households that comply with "Fair Market Value Balance Sheet Certification" and "Family Living/Sources and Uses Certification" in the FBFM data (which are the most reliable data available) are used for the estimation. Although FBFM data are limited in household demographic information, Langemeier and Patrick (1990 and 1993) have successfully used FBFM data to analyze household consumption behavior. The model for this study requires at least five years of data for each household[19]. Therefore, data is arranged such that households which have at least five consecutive years of data are retained, even though this process causes loss of observations. In addition, the data is arranged in a repeated cross section format.

Tables 2a and 2b report mean values for the data based on demographic characteristics of households. Tables 3a and 3b describe mean values according to categories of income and consumption changes[20]. The first, second and third columns of Table 2a describe the min, max and mean values for the full data for each of the explanatory variables. For instance, the min decrease in consumption is $72,421.33, whereas the max increase is $292,274. The mean change for consumption is an increase of $4,704.26 with a standard deviation of $19,250.72. The fourth and fifth columns of Table 2a give the mean values for the explanatory variables based on whether households have children or not. Childless households have lower average consumption levels, debt ratios, and household members compared to households who have children. The

[19] Since Δ Ci, t+1 = {(Ci, t+1) – {[(Ci, t) + (Ci, t-1) + (Ci, t-2)]/3}, and Δ Yi, t = {(Yi, t) – {[(Yi, t-1) + (Yi, t-2) + (Yi, t-3)]/3}, this study requires at least 5 consecutive years of data for each household.

[20] Quartile values for consumption increase/decrease and income increase/decrease:
Consumption increase of min=0.014%, q1=9%, median=19%, q3=39%, max=650%.
Consumption decrease of min=0.021%, q1=6%, median=13%, q3=23%, max=72%.
Income increase of min=0.10%, q1=25%, median=57%, q3=123%, max=303,830%.
Income decrease of min=0.025%, q1=18%, median=39%, q3=69%, max=1,702%. The large changes in income are due to the fact that some farmers have negative income.

means difference t-test results validate the difference of these values at 1% significance level. For instance, households that have no children have a debt ratio of 26.11%, whereas households that have children have a debt ratio of 34.55%. It is most probable that households with children consume more and part of this consumption is supported by borrowing, especially in periods of low income. However, there is no difference in the mean values for change in income level and change in consumption level within the two groups.

The sixth and seventh columns of Table 2a display mean values for households who have below average income and who have above average income. For instance, households who have below average income compared to households who have above average income have on average $14,156.46 more change in income, $1,885.63 more change in consumption levels and higher debt ratios where the t-tests are significant at 1%, 10% and 1% levels, respectively. This might be due to the fact that lower income families might face more fluctuations in income and thus consumption, which might be supported with acquiring higher debt. Table 2b displays mean values based on location of households. For instance, means difference t-test shows a significant difference for change in income level and debt ratio between Central and Northern Illinois. Central Illinois has on average a debt ratio of 30.46%, whereas Northern Illinois has a debt ratio of 34.58%, which might be due to the high cost of living in Northern Illinois.

Table 3a presents mean values based on two groups of income changes and consumption changes[21]. For instance, change in consumption is higher on average by $3,917.99 for households whose income increase is greater than 50% compared to households whose income increase is between 0% and 50%. However, although households who experience a decrease in income are expected to decrease their consumption, the data indicates a positive change in consumption level. This might be due to the fact that such households finance consumption

[21] The first group is based on a change of 0% and 50%; the second group is based on a change of more than 50%.

through debt acquisition. However, when households are compared based on consumption increase categories, it is observed that households who face consumption increase of more than 50% have lower debt ratios compared to other household groups. This might be due to the fact that households with higher a debt ratio might be associated with lower consumption increase because they need to pay off their debt. But increases or decreases in consumption levels are not associated with any change in income level.

Table 3b reports mean values based on four groups rather than two groups of income and consumption changes[22]. This might help to capture the effects that cannot be realized by only two groups. For instance, from column 3 of Table 3b it can be seen that households who face an income increase of 0% to 25% have $6,159.93 and $5,853.18 less consumption level and change in consumption level, respectively, compared to households who face an income increase of more than 75%, unlike other categories of income increases. Furthermore, households who face an income decrease of 0% to 25% have $7,913.18 more in consumption level compared to households who have an income decrease of more than 75%. However, they didn't experience a significant change in consumption level. Households who face an income decrease of more than 75% have higher debt ratio compared to households who face an income decrease of 0% to 25%. The same story can be concluded between households who face an income decrease of 25% to 50% and households who face an income decrease of more than 75%. These results appear to support the claim that for some specific categories of increases in income, households do not differ in terms of changes in their consumption behaviors. However, for higher changes in incomes, households change consumption positively. Note that for the cases where households face reductions in income, there are no significant differences in changes in consumption

[22] The first group is based on a change of 0%-25%, the second group is based on a change of 25%-50%, the third group is based on a change of 50%-75%, and the fourth group is based on a change of more than 75%.

between different household groups. This might be due to borrowing effects. Furthermore, categories of consumption decreases and consumption increases do not display any differences between household groups over income levels or changes in income. In addition, it appears that there is no feedback caused from consumption to income. The results from the descriptive analysis seem to support the claim that there may be different effects of changes in income over changes in consumption. These differential effects can be further analyzed by means of OLS regression.

V. Results

Table 4 reports the results for the OLS regression. No outlier adjustment is performed[23]. The symbols "a" and "b" in Table 4 refer to the dataset for 1995 to 2005, and 2000 to 2005, respectively. For instance "1a" refers to regression type 1 for the dataset 1995 to 2005, whereas "1b" refers to the regression type 1 for the dataset 2000 to 2005. The regression for dataset 2000 to 2005 is performed to check the robustness of results. Three different types of regressions are performed. The 1st and 2nd columns of Table 4 refer to the regression where changes in income are regressed over changes in consumption to estimate the effect of income changes over consumption changes. However, the possible different effects of various ranges of income changes are not considered in this regression. The 3rd and 4th columns of Table 4 relate to the regression where income levels are regressed over consumption levels to identify the determinants of household consumption. The 5th and 6th columns of Table 4 point to the regression where dummies for category of income changes are used to determine whether

[23] In Stata, OLS regression is run with "robust" command. Note that outlier adjustments are omitted because even if three standard deviations from the mean are replaced with mean +/- 3 standard deviations, the results do not change.

different ranges of income changes affect consumption changes differently[24]. Note that when dummies for ranges of income changes are used in the regression, income change variable is not included within the model to prevent collinearity since the dummies are obtained through income change definition.

Results for regression 1a indicate that income changes are positively significant at the 5% significance level for explaining consumption changes, as expected. For instance, for a $1 increase in income, change in consumption is expected to increase by $0.0321. Another significant variable that explains household consumption changes is the number of household members. For each additional household member, change of household consumption is expected to increase at the 1% significance level. The positive effect of number of household members over change in household consumption supports the hypothesis for a positive sign. Furthermore, households that have children have a lower change of consumption compared to childless households at the 10% significance level, in conformation with our expectations but in contradiction with the mean difference t-test results of descriptive analysis in Table 2a. This impact might be due to the fact that once households have children they may prefer to plan ahead to avoid financial uncertainty; thus, changes in consumption might be lower for these households compared to the childless households. In addition, since the 2004 dummy is significant at 1%, there is a higher change in consumption in 2004 compared to 2005 where the 2005 dummy is the reference dummy and so is omitted. This might be due to the fact that farm households might have received signals regarding the reauthorization of the 2002 Farm Bill in 2007, and therefore might have preferred to keep a lower change of consumption in 2005 compared to 2004.

[24] Recall that reference category is income decreases of more than 50%. However, 50% is just an arbitrary choice. When different percent levels are tried as the reference, results stay the same. Furthermore, the category representing no change is not used as a reference since it has very few observations.

Results for regression 2a demonstrate that previous year income level, number of household members, debt ratio, having children within household, and having above average income are significant determinants of household consumption levels. For instance, previous year income level and number of household members positively affect household consumption at the 1% significance level. Furthermore, the household debt ratio has a nonlinear effect over household consumption at 1% significance level because the coefficient of the debt ratio squared is significantly negative. In other words, household debt increases household consumption, which is consistent with result of Shim (1991), but after a certain level of debt, household consumption starts to decrease. In addition, households with above average income have higher consumption levels compared to households with below average income at the 1% significance level. Moreover, households that have children have more consumption compared to childless households at the 10% significance level. Unlike the 1st regression, this time years 1999 to 2002 have lower impacts over household consumption compared to 2005.

Results for regression 3a imply that as the number of members in a household increase, so do changes of consumption at the 1% significance level. For instance, for each additional member, change in household consumption is expected to increase. Furthermore, households with children compared to childless households have lower change of consumption at the 5% significance level. In addition, it is found that households with different levels of changes in income face different levels of changes in consumption, as expected. For instance, households that have income increases of more than 50% seem to have higher changes of consumption compared to households who face income decreases of more than 50% at the 1% significance level. However, the same conclusion cannot be made for the households with income changes of between -50% and +50%. For instance, decreases in income of less than 50% or increases in income of less than 50% do not change consumption in a significant way compared to a decrease

in income of more than 50% (the reference). This finding agrees with results from descriptive analysis, where it is suggested that consumption changes with higher levels of income changes. These results may be explained by the fact that household consumption is only slightly affected by changes in income and are consistent with the results of Girao et al (1974) and Langemeier and Patrick (1990).

To illustrate the robustness of results, the same regressions are repeated with data from 2000 to 2005. Recall that data spanning five years is needed to run the regression. The results obtained from regressions 1b and 3b indicate that contrary to expectations, households with above average income have lower changes of consumption. In addition, no significance is found regarding the effect of changes of income over changes of consumption.

Since the determinants of changes of consumption differ from one dataset to another, caution must be exercised in the interpretation of our results. However, one explanation for differences in the significance of changes of income over changes of consumption might be that with the 2000-2005 dataset most of the change in income might be due to change in temporary income, whereas with the 1995-2005 dataset most of the change in income might result because of change in permanent income. As re-iterated in the literature, according to the theory only permanent income affects consumption; thus, only changes in permanent income will affect changes in consumption (Deaton, 1992 and 1997). Furthermore, the propensity to consume might be low (e.g.0.0321 in regression 1), which is consistent with Girao (1974) and Langemeier and Patrick (1990). One explanation is that increases in income might not necessarily lead to proportionate increases in consumption due to temporary changes in income that might result e.g. because of fluctuations in weather.

VI. Summary

The purpose of this paper is to determine the effect of changes of income and demographic variables on changes of consumption by using FBFM data for Illinois farms. Descriptive analysis is performed for this purpose and the results obtained from descriptive analysis are analyzed in a multivariate environment by running OLS regressions. This study finds that consumption changes with income, but only at higher levels of income changes. Furthermore, household consumption is not affected by decreases in income or with low increases in income.

This research makes a significant contribution to the literature on farmer consumption patterns because it tries to determine the ranges of income changes at which consumption patterns of farmers change significantly by using a unique and rich dataset of consumption and farm income measures. The findings of this study are, however, not robust when dataset with fewer years of data is considered. Therefore, these results must be further analyzed. A more sophisticated econometric model can also be applied in the future.

Future researchers might also consider correcting for possible endogeneity bias resulting from the fact that education is correlated with both income and consumption but is omitted from this analysis. Assuming income is positively related to consumption, failure to account for this omitted variable bias will lead to an overestimate of the effect of consumption on income for this study. Additional effort could also be directed in answering how much of change in income in period t comes from a change in permanent income or temporary income and how much these components of income changes (temporary or permanent change in income) result in changes in consumption. Another opportunity for further research could be to integrate variables such as marital status of household head, whether the female or male household member or both works off-farm, and changes in interest rate by using a different dataset.

References

Barry P.J., C.B. Baker, and L.R. Sanint. "Farmers' Credit Risks and Liquidity Management." *American Journal of Agricultural Economics* 63 (1981): 216-227.

Becker, G.S. 2006. *CRS-RS22131 Farm Bill in Brief*. U.S. Department of State: Washington DC, March. Retrieved November 8, 2006, from http://www.nationalaglawcenter.org/assets/crs/RS22131.pdf

Deaton, A. 1997. *The Analysis of Household Surveys: A Microeconomic Approach to Development Policies*. Baltimore, Maryland: John Hopkins University Press.

Deaton, A. 1992. *Understanding Consumption*. New York, New York: Oxford University Press.

Edwards, W. 2004. "Analyzing a Net Worth Statement". *Agricultural Marketing Resource Center,* November. Retrieved November 11, 2006, from http://www.agmrc.org/agmrc/business/operatingbusiness/analyzinganetworthstatement.htm

Girao, J.A., W.G. Tomek, and T.D. Mount. "The Effect of Income Stability on Farmers' Consumption and Investment." *The Review of Economics and Statistics* 56 (1974): 141-149.

Hall, R.H. "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence." *Journal of Political Economy* 86 (1978): 971-987.

Hull, J.W. 2006. *The 2007 Farm Bill in Context.* Atlanta GA: Southern Legislative Conference-The Council of State Governments, June.

Illinois Association of Realtors, 2005 Market Statistics. Retrieved November 21, 2006 from, http://www.illinoisrealtor.org/iar/marketstats/quarterly/2005/4Q05%20all%20sales.pdf.

Langemeier, M.R., and G.F. Patrick. "Farm Consumption and Liquidity Constraints." *American Journal of Agricultural Economics* 75 (1993): 479-484.

Langemeier, M.R., and G.F. Patrick. "Farmers' Marginal Propensity to Consume: An Application to Illinois Grain Farms." *American Journal of Agricultural Economics* 72 (1990): 309-316.

Miles, D. "A Household Level Study of the Determinants of Incomes and Consumption." *The Economic Journal* 107 (1997): 1-25.

Monke, J. 2006. *CRS-RL33271 Farm Commodity Programs: Direct Payments, Counter-Cyclical Payments, and Marketing Loans*. U.S. Department of State: Washington DC, March. Retrieved November 8, 2006, from http://www.nationalaglawcenter.org/assets/crs/RL33271.pdf

Morduch, J. "Income Smoothing and Consumption Smoothing." *Journal of Economic Perspectives* 9 (1995): 103-114.

Musgrove, P. "Determinants of Urban Household Consumption in Latin America: A Summary of Evidence from the ECIEL Surveys." *Economic Development and Cultural Change* 26 (1978): 441-465.

Musgrove, P. "Permanent Household Income and Consumption in Urban South America." *The American Economic Review* 69 (1979): 355-368.

Paulin, G.D., and D.L. Ferraro. “Do expenditures explain income? A study of variables for income imputation.” *Journal of Economic and Social Measurement* 22 (1996): 103-128.

Shim, Y., J.D. 1991. “Consumer Debt: Implications for Consumption Behavior of Households in the United States” PhD dissertation, University of Illinois at Urbana-Champaign.

Wilcox, J.A. “Liquidity Constraints on Consumption: The Real Effects of Real Lending Policies.” *Economic Review*, Federal Reserve Bank of San Francisco, Fall 1989, pp. 39-52.

Table 1: Variable Definitions and Expected Signs

	Definitions	**Expected Signs**
Dependent Variable:		
Change in Consumption	(Family Living Expenses in t+1[a])-(Equal Weighted Average of Family Living Expenses in t, t-1, t-2)	
Explanatory Variables:		
Change in Income	(Net Income[b] in t)-(Equal Weighted Average of Net Income in t-1, t-2, t-3)	+ / no effect
Debt Ratio	(Total Liabilities in t+1)/(Total Assets in t+1)	ambiguous
Debt Ratio^2	[(Total Liabilities in t+1)/(Total Assets in t+1)]^2	ambiguous
Size of Household	Number of Household Members	+
Age of Household Head	2006-Operator's Birth Year	+
Age^2 of Household Head	Age of Household Head^2	-
Owned Land	Owned Acres	+
Region Household is Located	Dummy for Northern Illinois[c]	+
Region Household is Located	Dummy for Central Illinois[c]	+
Financial Health of Household	Dummy for Household Being Rich[d]	+
Household Has Children	Dummy for Household Having Children[e]	+/-

[a] t+1 refers to time period t+1.

[b] Net Income = Net Farm Income + Non-Farm Income.

[c] Southern Illinois is the reference region.

[d] Households who are poor are the reference point.

[e] Households who do not have children are the reference point.

Note: Other than the above dummies; time dummies, as well changes of income dummies are also used in the model.

Table 2a: Mean Values Based on Demographic Characteristics of Households

Columns:	1	2	3		4	5		6	7
	Min	Max	Mean		No child	Has child		Below average income	Above average income
Previous year income level[+]	-159,311.00	462,655.00	75,948.80		74,260.23	77,040.25		55,370.06	100,152.37
			(59,898.77)		(62,543.61)	(58,132.52)		(44,755.68)	(66,119.43)
					(-2,780.02)			**(-44,782.31)*** **	
Consumption level	10,898.00	337,247.00	56,011.59		51,373.67	59,009.46		51,995.21	60,735.44
			(25,092.31)		(27,949.83)	(22,571.11)		(23,308.42)	(26,281.64)
					(-7,635.79)* **			**(-8,740.23)*** **	
Change in income level	-266,254.67	327,447.33	13,475.32		14,522.59	12,798.38		19,980.61	5,824.15
			(54,139.28)		(55,277.36)	(53,409.06)		(45,222.12)	(62,201.08)
					(1,724.21)			**(14,156.46)*** **	
Change in consumption level	-72,421.33	292,274.00	4,704.26		5,061.00	4,473.66		5,570.76	3,685.13
			(19,250.72)		(22,444.42)	(16,876.61)		(17,979.64)	(20,611.90)
					(587.34)			**(1,885.63)***	
Debt ratio	0.00	95.24	31.24		26.11	34.55		35.28	26.48
			(19.19)		(18.37)	(18.99)		(20.13)	(16.85)
					(-8.44)* **			**(8.80)*** **	
Age of oldest child	0.00	29.00	10.54		0.00	17.35		9.70	11.53
			(9.46)		(0.00)	(5.39)		(9.35)	(9.49)
					(-17.35)* **			**(-1.83)*** **	
Number of household members	0.00	10.00	3.25		1.89	4.14		3.14	3.39
			(1.45)		(0.48)	(1.16)		(1.44)	(1.46)
					(-2.25)* **			**(-0.25)*** **	
Age of operator	31.00	83.00	55.43		62.56	50.82		55.36	55.51
			(9.35)		(8.47)	(6.60)		(9.97)	(8.57)
					(11.73)* **			**(-0.15)**	
Owned acres	0.00	1.00	0.19		0.25	0.16		0.18	0.21
			(0.22)		(0.25)	(0.20)		(0.23)	(0.20)
					(0.09)* **			**(-0.03)*** **	
Number of observations	1,569	1,569	1,569		616	953		848	721

The values in first parentheses are the standard deviations.

The values in bold are the differences between means of the two groups. ***, **, * refer to 1%, 5% and 10% significance levels, respectively obtained by means difference t-test.

[+] Unlike wage earners, farm families can have negative incomes.

Table 2b: Mean Values Based on Regions Household is Located

Columns:	1	2	3		Difference of means		
	Central Illinois (C.)	Northern Illinois(N)	Southern Illinois(S)		C-N	C-S	N-S
Previous year income level	76,002.57 (57,337.49)	77,184.08 (66,683.25)	67,254.42 (79,872.25)		**(-1,181.51)**	**(8,748.15)**	**(9,929.66)**
Consumption level	56,324.83 (25,586.80)	55,179.20 (22,456.14)	52,864.35 (27,115.33)		**(1,145.63)**	**(3,460.47)**	**(2,314.84)**
Change in income level	11,275.72 (52,159.96)	20,843.11 (58,514.12)	26,568.05 (70,646.36)		**(-9,567.40)****	**(-15,292.33)**	**(-5,724.94)**
Change in consumption level	4,671.26 (19,775.97)	4,877.94 (17,162.69)	4,526.86 (17,459.99)		**(-206.68)**	**(144.40)**	**(351.08)**
Debt ratio	30.46 (18.93)	34.58 (20.77)	31.55 (13.75)		**(-4.12)*****	**(-1.09)**	**(3.02)**
Number of household members	3.23 (1.46)	3.35 (1.43)	3.23 (1.31)		**(-0.12)**	**(0.00)**	**(0.12)**
Age of operator	55.72 (8.98)	54.06 (10.96)	56.19 (7.56)		**(1.66)****	**(-0.47)**	**(-2.13)**
Owned acres	0.19 (0.21)	0.21 (0.26)	0.33 (0.29)		**(-0.02)**	**(-0.15)*****	**(-0.12)*****
Number of observations	1,237	284	48				

The values in parentheses underneath the mean values are the standard deviations.

The values in bold are the differences between means of the two groups. ***, **, * refer to 1%, 5% and 10% significance levels, respectively obtained by means difference t-test.

Table 3a: Mean Values According to Categories of Income and Consumption Changes

Columns:	1	2	3	4	5	6	7	8
	Income Increase		Income Decrease		Consumption Increase		Consumption Decrease	
	0<=II<=50%	II>50%	0<=ID<=50%	ID>50%	0<=CI<=50%	CI>50%	0<=CD<=50%	CD>50%
Previous year income level	85,102.75	110,291.67	58,268.94	7,640.46	79,718.41	78,805.36	70,862.36	69,679.69
	(44,321.52)	(65,261.13)	(31,608.73)	(32,826.20)	(60,880.82)	(57,276.33)	(58,711.56)	(79,366.49)
	(-25,188.92)* **		**(50,628.48)*** **		**(913.05)**		**(1,182.66)**	
Consumption level	54,834.57	59,696.50	55,869.61	50,018.15	59,528.02	83,297.37	45,244.13	30,417.92
	(23,299.82)	(27,825.77)	(23,607.98)	(22,584.79)	(21,108.72)	(40,861.08)	(15,802.14)	(14,468.92)
	(-4,861.93)* **		**(5,851.46)*** **		**(-23,769.36)*** **		**(14,826.21)*** **	
Change in income level	16,118.28	64,127.75	-17,354.31	-59,753.02	17,696.45	20,233.71	7,105.72	-6,029.56
	(13,297.55)	(44,817.24)	(15,990.08)	(39,853.48)	(52,701.52)	(52,660.90)	(54,681.65)	(89,648.83)
	(-48,009.48)* **		**(42,398.71)*** **		**(-2,537.27)**		**(13,135.28)**	
Change in consumption level	3,741.69	7,659.68	3,744.19	1,228.19	8,781.16	39,318.08	-8,253.38	-39,820.44
	(16,782.06)	(23,177.28)	(16,935.81)	(15,930.82)	(7,010.22)	(31,655.28)	(7,147.85)	(13,909.39)
	(-3,917.99)* **		**(2,516.00)* **		**(-30,536.93)*** **		**(31,567.06)*** **	
Debt ratio	27.94	33.59	28.96	35.53	32.47	28.68	30.45	30.75
	(19.96)	(18.36)	(18.17)	(19.68)	(18.58)	(18.63)	(19.95)	(20.89)
	(-5.65)* **		**(-6.57)*** **		**(3.80)** **		**(-0.30)**	
Number of household members	3.30	3.20	3.32	3.19	3.36	3.08	3.17	3.00
	(1.50)	(1.45)	(1.38)	(1.48)	(1.51)	(1.41)	(1.38)	(1.29)
	(0.10)		**(0.13)**		**(0.29)** **		**(0.17)**	
Age of operator	55.14	54.79	56.08	56.44	54.64	55.90	56.23	55.85
	(9.24)	(9.44)	(9.38)	(9.21)	(9.23)	(10.25)	(9.22)	(7.54)
	(0.34)		**(-0.36)**		**(-1.26)**		**(0.39)**	
Owned acres	0.19	0.20	0.19	0.21	0.20	0.19	0.19	0.19
	(0.20)	(0.23)	(0.21)	(0.24)	(0.22)	(0.22)	(0.22)	(0.16)
	(-0.01)		**(-0.02)**		**(0.01)**		**(0.01)**	
Number of observations	438	536	360	235	754	166	636	13

II refers to income increase, ID refers to income decrease.

CI refers to consumption increase, CD refers to consumption decrease.

The values in bold are the differences between means of the two groups. ***, **, * refer to 1%, 5% and 10% significance levels, respectively obtained by means difference t-test.

The values in first parentheses are the standard deviations.

Table 3b: Mean Differences of Category of Income and Consumption Changes

Columns:	1	2	3	4	5	6
	Percent of					
	0,25-25,50[a]	0,25-50,75	0,25->75	25,50-50,75	25,50->75	50,75->75
	Income Increase					
Previous year income level	(-12,746.84)*	(-23,917.46)***	(-33,256.72)***	(-11,170.62)	(-20,509.88)***	(-9,339.26)
Consumption level	(-2,018.12)	(-4,601.54)	(-6,159.93)**	(-2,583.43)	(-4,141.81)	(-1,558.39)
Change in income level	(-16,474.05)***	(-30,210.24)***	(-64,092.95)***	(-13,736.19)***	(-47,618.90)***	(-33,882.71)***
Change in consumption level	(-1,982.26)	(-1,776.47)	(-5,853.18)***	(205.79)	(-3,870.92)	(-4,076.71)
Debt ratio	(-3.35)	(-4.02)	(-8.23)***	(-0.67)	(-4.88)**	(-4.21)
Number of household members	(-0.26)	(-0.04)	(0.00)	(0.22)	(0.26)	(0.04)
Age of operator	(1.01)	(0.39)	(0.93)	(-0.62)	(-0.08)	(0.54)
Owned acres	(0.02)	(0.00)	(0.00)	(-0.02)	(-0.03)	(0.00)
	Income Decrease					
Previous year income level	(18,286.13)***	(35,861.86)***	(77,802.70)***	(17,575.74)***	(59,516.57)***	(41,940.83)***
Consumption level	(1,473.35)	(4,809.38)	(7,913.18)**	(3,336.03)	(6,439.83)*	(3,103.80)
Change in income level	(19,030.20)***	(38,459.60)***	(60,792.21)***	(19,429.40)***	(41,762.01)***	(22,332.61)***
Change in consumption level	(-1,060.45)	(1,095.99)	(2,909.35)	(2,156.44)	(3,969.79)	(1,813.35)
Debt ratio	(0.98)	(-4.12)	(-7.92)***	(-5.09)	(-8.90)***	(-3.81)
Number of household members	(-0.07)	(-0.13)	(0.30)	(-0.07)	(0.37)	(0.44)*
Age of operator	(-1.27)	(-1.07)	(-0.75)	(0.19)	(0.52)	(0.32)
Owned acres	(-0.01)	(0.01)	(-0.05)	(0.02)	(-0.04)	(-0.06)
	Consumption Increase					
Previous year income level	(1,422.67)	(5,324.86)	(-4,454.85)	(3,902.19)	(-5,877.52)	(-9,779.71)
Consumption level	(-7,155.27)***	(-17,107.12)***	(-38,351.54)***	(-9,951.85)***	(-31,196.27)***	(-21,244.43)***
Change in income level	(-2,133.42)	(3,758.27)	(-13,095.29)	(5,891.68)	(-10,961.88)	(-16,853.56)
Change in consumption level	(-11,133.90)***	(-22,890.67)***	(-49,306.74)***	(-11,756.77)***	(-38,172.83)***	(-26,416.06)***
Debt ratio	(0.01)	(1.75)	(6.76)**	(1.73)	(6.74)**	(5.01)
Number of household members	(-0.13)	(0.13)	(0.42)	(0.26)	(0.54)**	(0.28)
Age of operator	(-0.21)	(-0.87)	(-1.98)	(-0.66)	(-1.77)	(-1.11)
Owned acres	(-0.02)	(0.03)	(-0.03)	(0.05)	(-0.01)	(-0.06)
	Consumption Decrease					
Previous year income level	(3,999.91)	(1,931.08)	NA	(-2,068.84)	NA	NA
Consumption level	(8,569.00)***	(16,429.53)***	NA	(7,860.53)	NA	NA
Change in income level	(5,475.78)	(14,159.84)	NA	(8,684.06)	NA	NA
Change in consumption level	(12,850.40)***	(33,971.45)***	NA	(21,121.06)***	NA	NA
Debt ratio	(-1.24)	(-0.53)	NA	(0.71)	NA	NA
Number of household members	(0.37)**	(0.24)	NA	(-0.13)	NA	NA
Age of operator	(-0.62)	(0.27)	NA	(0.89)	NA	NA
Owned acres	(0.01)	(0.01)	NA	(0.00)	NA	NA

The values in bold are the differences between means of the groups.

***, **, * refer to 1%, 5% and 10% significance levels, respectively obtained by means difference t-test.

[a] e.g.0,25- 25,50 refers to mean difference of income/consumption increase/decrease in categories of 0-25% to 25-50%.

Table 4: Results for Different Versions of the Income and Consumption Regression

Columns:	1	2		3	4		5	6
Regression types[+]:	1a	1b		2a	2b		3a	3b
Dependent variable:	Consumption change	Consumption change		Consumption level	Consumption level		Consumption change	Consumption change
Independent variables:								
Intercept	18,942.57	17,497.35		13,640.63	6,592.28		17,031.30	17,711.08
	(14,529.72)	(18,304.15)		(17,133.21)	(23,640.7)		(14,549.55)	(18,745.85)
Income change	0.0321	0.0044		NA	NA		NA	NA
	(0.01)**	(0.02)		NA	NA		NA	NA
Previous year income level	NA	NA		0.0771	0.0620		NA	NA
	NA	NA		(0.02)***	(0.02)***		NA	NA
Age of the operator	-704.12	-333.20		-194.43	279.85		-706.93	-414.33
	(533.77)	(621.23)		(623.59)	(826.08)		(542.43)	(628.54)
Age of the operator^2	6.08	2.50		6.24	2.19		6.07	3.14
	(4.83)	(5.49)		(5.7)	(7.56)		(4.9)	(5.56)
Number of household members	1,188.28	1,080.06		3,355.29	3,702.52		1,215.74	1,187.95
	(447.25)***	(891.72)		(570.89)***	(1,135.74)***		(449.91)***	(891.03)
Owned acres	2,264.51	8.55		-4,034.28	7.63		2,138.00	8.22
	(2,415.94)	(5.5)		(2,922.92)	(5.89)		(2,424.67)	(5.28)
Debt ratio	96.89	146.87		569.30	712.28		77.98	124.19
	(69.24)	(112.23)		(87.74)***	(147.69)***		(70.54)	(113.62)
Debt ratio^2	-1.48	-2.95		-4.57	-6.94		-1.24	-2.67
	(0.96)	(1.45)**		(1.22)***	(1.93)***		(0.98)	(1.47)*
2004	4,677.31	3,919.75		3,129.38	2,587.97		4,577.92	4,138.60
	(1,748.21)***	(1,767.75)**		(2,174.26)	(2,220.31)		(1,743.19)***	(1,782.33)**
2003	1,872.78	NA		-125.38	NA		1,658.53	NA
	(2,259.52)	NA		(2,483.99)	NA		(2,253.83)	NA
2002	-1,325.58	NA		-3,969.37	NA		-1,475.36	NA
	(1,609.66)	NA		(2,056.04)*	NA		(1,620.82)	NA
2001	324.05	NA		-5,436.95	NA		192.29	NA
	(1,577.06)	NA		(1,992.65)***	NA		(1,573.48)	NA
2000	1,252.50	NA		-4,692.88	NA		976.85	NA
	(1,970.18)	NA		(2,306.92)**	NA		(2,008.16)	NA
1999	234.80	NA		-7,585.25	NA		-457.95	NA
	(2,625.88)	NA		(3,091.4)**	NA		(2,601.69)	NA
Above average income	-1,638.72	-4,137.94		6,580.66	5,633.68		-1,285.38	-3,742.24
	(1,179.56)	(1,943.98)**		(1,377.59)***	(2,604.68)**		(1,269.26)	(1,951.24)*
Has children	-2,771.48	-4,010.89		3,480.03	129.82		-2,922.50	-4,395.21
	(1,471.56)*	(2,865.71)		(1,856.35)*	(3,699.96)		(1,470.54)**	(2,853.96)
Northern Illinois	432.25	-5,778.22		441.78	-6,422.43		471.89	-5,383.23
	(2,816.23)	(3,993.62)		(3,839.28)	(6,408.61)		(2,777.96)	(4,005.04)
Central Illinois	1,295.69	-3,213.09		3,033.45	-4,270.65		1,360.04	-2,640.49
	(2,676.3)	(3,742.14)		(3,685.13)	(6,209.79)		(2,643.79)	(3,799.77)
0%<Change in income<=50%	NA	NA		NA	NA		1,593.81	-198.97
	NA	NA		NA	NA		(1,586.57)	(4,278.22)
Change in income>50%	NA	NA		NA	NA		5,309.93	2,836.64
	NA	NA		NA	NA		(1,883.48)***	(4,362.8)
-50%<Change in income<=0%	NA	NA		NA	NA		2,270.28	4,029.79
	NA	NA		NA	NA		(1,415.75)	(5,039.19)
R-sq	0.0290	0.0411		0.1515	0.1237		0.0315	0.0466
Pr>F	0.0000	0.0471		0.0000	0.0000		0.0001	0.0775
Number of observations	1,569	598		1,569	598		1,569	598

[+]a refers to the dataset for years 1995 to 2005, whereas b refers to dataset for years 2000 to 2005.

The numbers in parentheses are the robust standard errors. ***, **, * refer to 1%, 5% and 10% significance levels, respectively.