Portfolio Decisions of Small Agribusinesses: Evidence from the 1993 National Survey of Small Business Finances[1]

by

Marionette Holmes[2]

Timothy A. Park[2]

ABSTRACT

This study develops a model for the financial portfolio allocations of small businesses and identifies the financial decisions of small agribusiness firms to develop optimal portfolio strategies. We will compare the performance of two econometric models in identifying firm and owner characteristics that influence asset and liability holdings in small agribusinesses.

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2 The authors are a graduate student and an associate professor in the Department of Agricultural and Applied Economics, The University of Georgia, Athens, GA 30602. Questions and comments can be addressed to Marionette Holmes, email: MHolmes@agecon.uga.edu

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I. INTRODUCTION AND JUSTIFICATION

In the early 90's, agribusinesses were encouraged to join the "wave" of shifting towards a small business structure in order to reap the benefits of niche marketing (Graham,1993). According to data generated from the Statistics of U.S. Businesses (SUSB), the agriculture sector consisted primarily of small firms. From 1988 to 1995, agribusinesses experienced the highest level of growth, in numbers, of small firms with an 39.9 percent increase.(SBA, Office of Advocacy, 1998.) In 1995, small firms also accounted for 88% of employment in the agricultural sector and 85% of the private sector’s payroll.

During this time, two-thirds of the nations labor force were employed by small businesses proving that the small business plays a significant role in the continued growth of the U.S. economy.

Financial decisions of small businesses are viewed as one of the primary determinants of the vitality of the firm. Poor financial planning is one of the major causes of small business failures. Small food and kindred product processors have consistently highlighted difficulties in identifying and accessing sources of financial capital as a primary constraint in enhancing the viability of financial management techniques for the small agribusiness (Torok, et al. 1991).

The recent wave of mergers and acquisitions of financial intermediaries has increased competition for small business loans

and placed additional pressure on firms to efficiently manage their financial portfolio. In this study we seek to develop a model for the financial portfolio allocations of small agribusinesses and to identify the financial decisions of small agribusiness firms in order to develop optimal portfolio strategies.

Berger and Udell (1998) propose that small businesses have access to a subset of financial assets and liabilities as opposed to large business firms due to lack of access to public issues and non-disclosure of financial statements. It is therefore assumed that small businesses possess incomplete financial portfolios.

The objective of this study is to evaluate and compare the performance of two econometric models in identifying financial and managerial characteristics that influence asset and liability holdings in small businesses. The two models that will be evaluated are 1) the sample selection model (King and Leape, 1998) and 2) the two-part model. The likelihood dominance criteria shall be employed to determine which model best exemplifies the decision making process.

The paper is organized as follows: In section 2 we present a literature review of small businesses financial decision making and portfolio theory. Section 3 presents the theoretical framework we use to develop our model, and Section 4 discusses

the empirical models we employ. We describe our data in Section 5 and results and conclusions in Section 6.

II. LITERATURE REVIEW

Small Firm Decision Making

The theory of financial decision making for small firms is a relatively neglected area in research literature. Despite the lack of proper framework, descriptive models have been developed to test the 3 modern theories of capital structure; the signaling theory, the tax theory and the contracting or agency theory.

Brewer and Genay (1994) examine the contracting hypothesis using data on investment activities of small business investment companies (SBIC) to determine whether their financial decisions are designed to minimize transaction costs. The authors hypothesize that the supply of financial instruments made available by the SBIC's to small firms would influence the probability of the entrepreneur's choice of holding one asset/liability vs. another. A probit model is used for empirical analysis. The results confirm that firms that are not owner-managed and manufacturing firms tended to use more debt than equity. Younger firms and smaller firms use more equity than debt.

Barclay and Smith (1995) test whether the three aforementioned modern theories of financial decision making could explain the corporate leverage choices of small firms. The

authors use pooled time series and cross-sectional data containing 5 major types of debt. The relationship between these classes of debt to the firm's market to book ratio, regulations, earnings, taxes and firm value was tested using a censored tobit model and fixed effects regression. The authors' findings support the contracting hypotheses and weakly supported the signaling hypothesis. The tax hypothesis receives mixed support.

Binks and Ennew (1996) use a maximum likelihood routine to test a subset of arguments of the asymmetric information (or signaling) hypothesis. The authors use cross-sectional data on over 6000 United Kingdom small firms. The analysis use survey data from a questionnaire concerning the owner's perceived reasons for financial limitations. The analysis seeks to determine the relationship between credit constraints of growing firms to good working relationships between the firm and the bank. The authors hypothesize that firm size, firm age, profitability, return on investment, overdrafts, collateral, type of collateral, approachability, trust and growth rates would influence this relationship. The authors find that firms with expected growth used less debt, firms with lower tax rates use equity vs. debt, and older firms used more debt. These studies have two common underlying assumptions. These assumptions are that the primary decision making unit is the firm and the objective of the firm is to maximize profits. Most small firms

are categorized as owner managed. Thus, as noted by Osteryoung, Newman and Davis (1997), the primary decision making unit is an individual and the objective of the owner is to maximize his/her personal wealth. The line of distinction between firm and owner are not clear for the small firm. Owners usually use personal assets as collateral for business loans. The businesses financial assets and liabilities, therefore, can be viewed as an extension of the owner's personal holding or portfolio. Given this assumption, this study employs portfolio theory for its framework.

Portfolio Theory

Uhler and Cragg (1971) have one of the first studies on portfolio theory. The authors use portfolio theory to examine the impact of income and non-human wealth on household's financial portfolio decisions. The study divides these decisions into two aspects, the level of diversification (what determines the number of assets held) of each household; and the probability of holding a particular asset or combination of these assets and the level of the assets. The authors use an extension of the multinomial model that allows the probabilities to vary with specified independent variables.

Ioannides (1992) introduces a dynamic component while still employing the traditional portfolio theory assumptions of an individual decision-maker seeking to maximize his/her lifetime

utility as derived from consumption. The author notes that portfolio theory is hard to structure for empirical investigation and suggests a reduced-form utility comparison. The reduced-form utility comparison assumes that the portfolios individuals hold are the outcome of each household's selection from a complete set of various combination of assets holdings and their respective quantities. Thus, by using the reduced-form utility method, the assumption is made that households consider specific combination assets separately rather than the entire portfolio.

King and Leape (1998) extend the conventional portfolio theory by noting individuals or households usually hold incomplete portfolios. This additional assumption alters the previous model by introducing the notion of sample selectivity bias. The authors use the reduced-form utility method but with this modification in the empirical analysis. The model we employ is a variation of the household allocation model. We assume that small agribusinesses hold incomplete financial portfolios due to informational opacity. The model is further discussed in the next section.

III. THEORETICAL FRAMEWORK

We use a variation of King and Leape’s household portfolio allocation model. The portfolio choice of small businesses is an intertemporal expected utility maximization problem of the owner subject to his intertemporal wealth constraint. We employ this

economic interpretation based on the assumption that small firm owners seek to maximize their personal wealth and that profit constitutes a majority of that income.

We use the expected intertemporal utility function to model two assumptions: 1) the owner's risk preferences influence on the choice of financial asset/liability and 2) the owner's expected utility is derived from uncertain future profits. We also assume that all owners are risk averse.

Each owner's preferences are thus represented by the additively separable utility function below. Utility is a strict concave function of consumption (C) and time (t). The variable time(t) represents the lifetime of the firm owner.

$$V = \sum_{0}^{T} U(C,t)dt \qquad \textbf{(1)}$$

where U is the von-Neumann Morgenstern expected utility function.

The wealth constraint of the owner is a function of his/her initial level of wealth and the future value of the firm's profits. The wealth constraint is as follows:

$$W(0) = W_0, \qquad \textbf{(2)}$$

$$dW = \sum_{j=1}^{J} Y(t) + p\,(t)dt - C(t)dt \qquad \textbf{(3)}$$

where W represents the initial level of wealth, dW represents the change in the budget constraint, Y_t represents the value of asset or liability j held and $p\,(t)$ represents future profits. The value of the firm i's profits can be denoted as:

$$p^i = e^i + q.d^i \quad \textbf{(4)}$$

where p^i is the value of future profits for firm i, e^i is the value of equity for firm i, d^i is the value of debt and q represents the "price" of debt or the interest rate. Profits of the firm are directly related to the return on equity and the return on debt since all profits are distributed to those who have equity claims or debt claims against the firm.

The maximization of (1) subject to the constraints of (2) and (3) yield the appropriate first order conditions. These first order conditions are then inverted to obtain the conditional asset demand. We use a demand system with endogenous switching. This is done based on the assumption of comparing the owner's utility level for each combination of assets/liabilities.

We assume that the owner can face 2^n-1 number of combinations, thus estimation of the utility level for each of these combinations must be derived. We estimate the maximum utility level associated with each combination and the probability of obtaining that maximum utility level. We use the sample selection model and two-part model for estimation. These models are discussed in detail in the next section.

IV. EMPIRICAL MODELS

The sample selection model

The sample selection model represents the choice equation that indicates whether an owner has financial holdings of zero or positive is

$$I = x_1 a + u_1 \qquad \textbf{(5)}$$

where x_1 is the vector of explanatory variables and a is the corresponding vector of estimated parameters. If a non-negative amount are observed, then $I \geq 0$ and the model for the amount held is specified as

$$y = x_2 b + u_2 \quad I \geq 0 \qquad \textbf{(6)}$$

where x_2 represents the explanatory variables with estimated parameters b. The error terms u_1 and u_2 are independent of the regressors x_1 and x_2 and are bivariate normal (0, 0, 1, 1, r_e). Using Heckman's two-step limited-information maximum-likelihood (LIML) procedure, equation (5) is estimated to obtain a in equation (7). This is used to form the estimated inverse Mills ratio $l(x_1 a) = f(x_1 a)/\Phi(x_1 a)$ where $f(\cdot)$ and $\Phi(\cdot)$ are the p.d.f. and c.d.f. of the standard normal distribution. Estimates of b and $r s$ are

$$y = x_2 b + r s \hat{l} + e \qquad \textbf{(7)}$$

obtained from the model where E(y | I > 0) = 0.

The two-part model

The two-part model separates the decision to purchase from the amount purchased, allowing these two decisions to be analysed separately. This is in keeping with traditional portfolio theory. Manning, Blumberg, and Moulton note that when a large portion of the sampled population does not have an asset, the holding decision is separate from the decision on how much to purchase. The two-part model mirrors these decisions by separately assessing the variables that shift the probability of purchase from those that influence the amount purchased.

The two-part model focuses on observed holdings by businesses and avoids predicting potential portfolio changes by owners. In addition, Manning, Duan and Rodgers claim that the sample selection model is inappropriate for modelling either the actual or potential level of demand.

Duan *et al*. maintains that the specification of the two-part model is robust and parsimonious, avoiding the distributional assumptions implicit in the sample selection model. Statisticians Little and Schenker (1993) also express doubts about the practical value of the sample selection model and conclude that the approach cannot generally be recommended. The sample selection model relies on the normality of the error term in forming the inverse Mill’s ratio and the assumption that the linear model is correctly specified. The Heckman method may

yield unstable estimates and can generate negative predictions for outcomes that are observed to be positive.

$$I = x_1 a + u_3, \quad u_3 \sim N(0,1) \qquad \textbf{(8)}$$

The two-part model identifies two components in observed portfolio decisions. The first component examines whether the individual purchases the product and the second assesses the amount purchased. The first equation is based on a probit (or logit) specification for the probability that the owner selects asset j where y > 0 if I > 0 and y = 0 otherwise. The second equation is

$$[y \mid I > 0] = x_2 b + u_4 \qquad \textbf{(9)}$$

a linear model for observed holdings where E [u_4 **|** I > 0] = 0 and u_4 is not required to follow a normal distribution. The two-part model ignores sample selection or adjustments for selectivity bias. In the two-part model the level of holdings is conditionally independent of the holding decision.

Parameter estimates from the sample selection model are unbiased when collinearity is present but other parameters from the model are distorted. Both the predictions and elasticities from the sample selection model are biased due to collinearity and the size of the bias increases with the degree of collinearity.

V. DATA DESCRIPTION

The data we use are taken from the 1993 National Survey of Small Business Finances. The survey was selected because it provided comprehensive cross-sectional data regarding the types of financial products used by small firms. The database also includes demographic information of the owners and characteristics of the small firms that would aid in determining portfolio decisions.

Information conducted during 1994-1995 on behalf of the Board of Governors and the US Small Business Administration (SBA). Information was collected via questionnaires and telephone interviews with non-farm, non-financial, for profit firms. The sample of 4,637 firms are representative of 4.99 million small U.S. businesses listed in 1993 on the Dun’s Market Identifier file. Financial information includes balance sheet and income data for the 1992 fiscal year with an inventory of financial assets and liabilities such as savings account, credit lines, capital leases, mortgages, equipment loans and other selected financial products. Information regarding the suppliers of the financial services such as banks and individuals was also reported along with the credit history and 3 year accounts of applications for credit by each firm.

We selected businesses within the SIC Codes of 20, 54 and 58 as satisfying the classification of an agribusiness firm. This yielded a sample of 411 or 9% of firms within the original sample.

We use the 11 categories of assets and liabilities listed in the balance sheet, which are listed in Table 1. The eleven assets/liabilities include cash, current checking account balance, current savings account balance and credit card balance, line of credit, leases, mortgage loans, vehicle loans, equipment loans, regular loans, other loans and equity. To reduce the number of combination dummy variables, we continue to follow the methodology of King and Leape by estimating a correlation coefficient matrix for the 11 categories. Variables with a correlation coefficient of 0.50 or more were aggregated into one group. Only 5 assets were able to meet this criterion and were labeled as short term financing instruments. A category for long-term debt was then created to further reduce the number of combination dummies leaving only 2 assets, credit cards and savings.

V. RESULTS AND ELASTICITIES

The results for our empirical analysis are presented in Tables 2 and 3. Table 2 presents long-term debt demand conditional on short-term financing, credit card holdings and

savings. Short-term holdings include cash, checking account balance and line of credit.

The sample selection model did not yield significant results. This finding supports Manning *et al.* hypothesis that the sample selection model is an inappropriate model. The two-part model does yield robust estimates; thus it is assumed that the distributional assumption of the sample selection model is incorrect.

Statistically significant variables include FIRMAGE, EXPER, GROWTH, and EDUC; therefore the age of the firm, the education level of the owner and anticipated growth influence an owner's decision of acquiring more long-term debt. These findings weakly support the findings of Binks *et al*. and contradict those of Brewer *et al*. We conclude that our results would support the signaling hypothesis. Small business owners therefore use debt to "signal" to outside investors or banks of their financial stability. However, this may increase the firm's exposure to bankruptcy. Federal Agencies such as the SBA could help a small firm reduce its exposure to bankruptcy by offering lower interest rates on equity types of financing to small firms through the SBIC.

From our conditional demand results, we were able to calculate net worth elasticities to determine how elastic the demand for debt given these firm/owner characteristics. These

elasticities are similar to wealth elasticities for traditional asset demand equations. Elasticities can be calculated from the Sample Selection model using the following equation:

$$h_{SS} = \left[a_i l\,(x_1 a + rs) + \frac{b_i}{x_2 b} \right] k_i \qquad \textbf{(10)}$$

where k_i is a continuous variable which influences both the holding decision and level held. X_1 is the vector of explanatory variables from the probability model and X_2 represents the vector of explanatory variables from the level model.

The elasticity for the two-part model is

$$h_{2P} = \left[a_i l\,(x_1 a) + \frac{b_i}{x_2 b} \right] k_i \qquad \textbf{(11)}$$

Elasticities are listed in Table 3. Elasticities for the variable EXPERIENCE was not presented since the estimate was very low. We find that the demand for long-term debt is relatively elastic with the age of the firm with an elasticity coefficient of 1.540. The education level of the owner and the decision for business expansion is relatively inelastic with the firm's debt level decision. The elasticity coefficients for these variables are 0.035 and 0.18 respectively. These findings imply that firms with highly educated owners and growing firms will not respond quickly to policy actions such as a change in loan rates. Commercial banks are able to offer higher interest rates to these firms to generate profits.

Summary and Conclusions

This study investigates the use of two alternative empirical methods for modeling portfolio theory. These models include the sample selection model and the two-part model. We model the influence of owner and firm characteristics on small agribusiness financial decision of long-term debt holdings. We use the findings of several studies to identify our explanatory variables. The experience and education level of the owner and the age of the firm and future plans for growth are found to influence portfolio decisions. The two-part model yields statistically significant estimates while the sample selection model provides no significant estimates. We calculate elasticities using the significant estimates. We find the age of the firm to be relatively elastic with debt levels. Education and anticipated growth are relatively inelastic.

Table 1. Variable Description and Summary Statistics[a]

Variable	Description	Entire Sample	Agri-Business
LONG	Long-term debt used such as vehicle leases etc.	324.73 (1912.62)	344.73 (1960.56)
FIRMAGE	Number of years since the Firm was founded, purchased or acquired.	15.3 (13.6)	14.8 (12.8)
MANAGE	= 1 for owner-managed[b]	3745	305
	= 0 otherwise	885	106
EDUC	Level of Education[b]		
	8th grade or less	1.68	2.91
	8th grade to 11th grade	2.39	3.41
	HS graduate or Equivalent	19.81	26.03
	Tech/some college	24.00	26.03
	Graduate of 4-yr college	30.68	10.17
	Post graduate (MBA, MD, etc)	21.26	11.44
SIZE	Number of employees[b]		
	0 to 1	64.50	43.55
	2 to 4	10.33	16.54
	5 to 9	12.46	18.49
	10 to 49	10.24	18.24
	50 to 499	0.13	0.00
	unknown	2.33	3.16
GROWTH	= 1 for anticipated growth	2.5	4.37
	= 0 for no growth	97.47	95.62
EXPER	Number of years of owning/managing	19.78 (11.32)	21.17 (12.00)
FINA	Combination dummy variable	0.04	0.07
Lambda	Inverse Mill’s ratio		
N	Sample Size	4637	411

[a]Mean values with standard deviations in parentheses.
[b]Number of individuals in each category.

Table 2. Estimates for Long term debt demand

Explanatory Variable	Probability of Selection	Sample Selection Model	Two-Part Model
FIRMAGE	0.195 (1.083)	23.920 (0.031)	270.820* (2.662)
MANAGE	0.016 (0.614)	-29.710 (-0.353)	1.720 (0.119)
EDUC	-0.007 (-1.226)	-31.530 (1.157)	6.180* (1.809)
SIZE	0.0291 (0.687)	-60.680 (0.476)	-7.820 (-0.340)
GROWTH	0.153* (4.323)	-240.470 (-0.669)	32.550* (1.861)
EXPER	0.4943×10^{-6} (0.961)	0.730×10^{-3} (1.106)	0.113×10^{-2}* (11.339)
DUMMY[c]		77.910 (0.092)	-22.630 (-0.081)
CONSTANT	-0.276 (1.085)	2780.280 (0.621)	-351.600 (-2.245)
LAMBDA		-3619.520 (-0.780)	
N	342	342	342

* Statistically significant at the .10 level
c Dummy variable for short-term finances, and credit card holdings

Table 3. Elasticity Estimates for Long-Term Debt Demand

Explanatory Variable	Two-Part Model
Holdings and Level Decision	
Age of Firm	1.540
Education level of owner	0.035
Anticipated Growth	0.180

References

Berger, A.N. "The Relationship Between Capital and Earnings in Banking." *Journal of Money, Credit and Banking* 27(1995):432-456.

Barclay, M.J. and Smith, Jr., C.W. "The Priority Structure of Corporate Liabilities." *Journal of Finance* 50 (1995): 899-917.

Berger, A. N. and G. F. Udell. "The Economics of Small Business Finances: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle." *Journal of Banking and Finance* 22 (1998): 613-673.

Brewer, E. and Genay, H. "Funding Small Businesses Through the SBIC Program." *Federal Reserve Bank of Chicago Economic Perspectives* 18 (1994): 22-34.

Chittenden, F., Hall, G. and Hutchinson, P. "Small Firm Growth, Access to Capital Markets and Financial Structure: Review of Issues and and Empirical Investigation." *Small Business Economics* 8 (1996): 59-67.

Graham, John R. (1993) "Smaller is Replacing Bigger in Business." Agrimarketing, 31, 98.

King, M.A. and J.I. Leape. "Wealth and Portfolio Composition: Theory and Evidence." *Journal of Public Economics* 69 (1998): 155-193.

Kotey, B. "Debt Financing and Factors Internal to the Business." *International Small Business Journal* 17 (1999): 11-29.

Little, R.J.A. and Schenker, N. (1993) Missing Data, in *Handbook of Statistical Modeling for the Social and Behavioural Sciences*., Arminger, G., Clogg, C.C. and Sobel, M.E. (eds) Plenum Press.

Manning, W.G., Blumberg, L. and Moulton, L.M. The Demand for Alcohol: The Differential Response to Price, *Journal of Health Economics* 14 (1995): 123-148.

Meyer, L.H. "The present and Future Roles of Banks in Small Business Finances." *Journal of Banking and Finance* 22 (1998): 1109-1116.

Pollak, R.A. and Wales, T.J. “The Likelihood Dominance Criterion.” *Journal of Econometrics*, 47(1991): 227-242.

Small Business Administration. “Small Business Growth by Major Industry, 1988-1995.” Office of Advocacy.

Torok, S.J., Menkhaus, Dale J. and Schroeder, Alan (1991). “Management Assistance Needs of Small Food And Kindred Products Processors," Agribusiness, 7 , 447-461.