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Growth-Enhancing Capital and Operating Plans of Small and Large Grain Farms

By Cesar L. Escalante and Peter J. Barry

Abstract

The heterogeneity of structural conditions of small and large farms influences these farms' choices of business growth strategies especially under increasing income risk conditions. This study's econometric results suggest that farms in general minimize family withdrawals and use farm revenue enhancement strategies. Smaller farms, however, also rely on non-farm sources of income for supplementary cash receipts and implement strategies designed to improve the productivity of their farm assets. Larger farms, on the other hand, tend to be more inclined to implement growth strategies that regulate their leverage position and affect their existing farmland control arrangements.

Introduction

Significant growth in a farm's equity capital over time provides a comprehensive indication of successful farm business performance. This growth measure directly reflects the accumulation of wealth, improvement of solvency positions, enhanced credit capacity, and greater potential for future income generation. This comprehensive growth concept suggests that the farm business could still realize growth even during periods of low farm income generating capacity. Under these conditions, the farm business relies on alternative strategies involving either capital or operating management decisions, or a combination of both.

In recent years, grain farms have experienced difficult hurdles in achieving business growth. Since the latter half of the1990s, the viability of most farms has been threatened by financial stress due to steadily declining crop prices commonly believed to have resulted from the "freedom to farm" attribute of the 1996 farm bill. In certain parts of the country, grain farmers had to contend with persistent drought conditions that significantly reduced crop yields and increased production risk. In a predominantly crop-producing region like Illinois, despite larger ad hoc government payments to grain farmers, farm income variability still remained relatively high (Ellinger, et al., 1999, 2000; Miller, Ellinger and Barry, 1994, 1995). Under such conditions, farmers faced the challenge to identify and implement alternative growth plans.

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This study utilizes farm-level data to determine differences in choices of growth strategies among available capital and operating management plans made by small and large grain farm businesses in Illinois (classified according to their average gross revenues) during significant downturns in farm incomes in the late 1990s. The main premise here is that small and large farms do not necessarily implement the same set of business growth plans. In this analysis, farm managers are reminded of the interdependence of capital and operating management decisions that are designed to enhance farm business growth. More importantly, this study demonstrates for farm managers that their tendencies to emphasize certain operating and/or capital management plans for growth are influenced by the size of their farm operations. The diversity of the financial and structural conditions of small and large farms could define the more preferred set of growth plans for these two sets of farms. The following sections provide a theoretical background to this study's objectives, describe the financial attributes of the farm database, and discuss the econometric analysis.

Farm Size and Business Growth

Farm size, among other demographic factors, would not only influence the pace of growth, but also choices of the types of strategies. Greater profitability realized under economies of scale supports the notion that farm size is positively related to financial growth (Hallam, 1993), although rapid growth in size could temporarily diminish operator efficiency as management adjusts to change in size. Shapiro, Bollman and Ehrensaft (1987) found that smaller farms tend to grow faster than larger farms, thus rejecting Gibrat's hypothesis that firm growth rate is independent of the initial size of the business. Sumner and Leiby (1987) analyze the relationship of the farm operator's human capital investment to the farm's cross-sectional size and growth patterns. Their results indicate that the operator's experience reduces the growth rate as increases in farm size of more than 1 percent were realized for each additional year of age for farmers with relative low experience.

This study presents another dimension of the linkage between farm size and financial growth by examining growth opportunities available to small and large grain farms. Results of USDA surveys confirm existing structural differences in farm conditions whereby smaller farms tend to account for relatively larger concentrations of non-farm incomes and owned farm assets. Moreover, large and small farms tend to implement different sets of risk management strategies that also influence business growth. For instance, small farms rely less on forward contracts in marketing their produce (Harwood, et al., 1999). These farm conditions are expected to influence a farmer's choice of growth plans, especially during periods of low farm incomes.

Operating and Capital Management Decisions for Growth

A business growth strategy could be either an operations or capital management decision (AgriSolutions, Inc., 2001). The potential for achieving higher equity growth rates is greater only if the farm business performs well in both of these interdependent categories of farm management. If the business is not able to resolve problems in one of these areas, the likelihood of achieving business growth diminishes. An earlier study on grain farmers' business decisions demonstrated such synergy between operations and capital management strategies (Escalante and Barry, 2002). The study's results indicate that higher equity growth rates are achievable under a combined set of operations and capital management strategies.

Operational strategies could either be revenue enhancing or cost reducing strategies, or both. Effective marketing strategies and enterprise diversification could generate reduced risk and/or higher return. Cost reduction strategies primarily entail improvements in operating efficiencies achieved through, among other ways, use of more cost-saving inputs and technologies.

Non-farm activities could also promote growth through a positive net influence of off-farm revenue enhancement strategies through investments and employment outside the farm, and cost control strategies that minimize withdrawals for family living expenses.

Capital management growth solutions include financial structure decisions that directly contribute to growth through more prudent borrowing decisions and indirectly promote growth if the profitability and asset productivity effects of incurring external debts dominate the potential effects of financial stress and incremental agency costs (Nasr, Barry and

Ellinger, 1998). Asset purchase and sales decisions could also increase growth if these decisions produce a net effect of increasing the overall productivity of the farm's existing assets.

Farm-Level Data on Cost Value Equity and Assets

This study will discern the key strategies implemented by a panel data set of Illinois grain farms[1] that continuously maintained certified usable financial and family living records under the Illinois Farm Business Farm Management (FBFM) system during the period 1996-1999. The FBFM system has an annual membership of about 7,000 farmers but rigorous certification procedures implemented by field staff usually results in much fewer farms with both certified financial and family living records. Hence, for the period 1996-1999, only fifty-two (52) grain farms satisfied such a criterion.

This study utilizes realized, instead of expected, farm equity. Estimates of cost-value equity were generated to eliminate most, if not all, of the contributions from unrealized nominal capital gains on farmland owned by the farm business. These values were estimated since the FBFM system reports only financial information based on fair market and modified cost values (Ellinger, et al., 2000). Under its fair market valuation, farmland is valued at current market levels with annual adjustments reflecting changes in Illinois farmland price indexes reported by the Economic Research Service of the USDA. On the other hand, FBFM applies a factor of 60% to the current year's farmland price index to generate modified cost estimates of fixed asset values. Inasmuch as farmland indexes increase annually, this procedure does not eliminate much of the impact on equity levels of unrealized nominal capital gains from the appreciation of land values in each year.

Most FBFM farms have long histories of land ownership (with some inherited properties acquired in the 1800s). Hence, it might be difficult to determine the original purchase values of land owned by FBFM member farms. This study instead derived estimates of cost-value equity figures using the 1995 FBFM fair market ending net worth and land values as starting points. The farm balance sheets in subsequent years are adjusted by holding the 1995 land value constant through the succeeding years. Incremental acreage holdings in every year are priced at the prevailing farmland price on the year of acquisition and the total purchase value is also held constant until the end of the sample period. Each farm's total asset and equity holdings are then accordingly adjusted. Such asset and equity estimates might not fully represent actual cost value figures but are more valid estimators of realized equity than the FBFM measure.

Proxy Measures of Growth Strategies

This study uses the same set of eight (8) variables for growth strategies considered by Escalante and Barry to discern differences in preferences for certain growth plans among small and large grain farms, classified according to their average gross revenues during the period 1996-1999. The USDA recommended cut-off gross revenue level of $250,000 (Hoppe, 2001) was used to determine the classes of small and large farms.

The strategies are classified as either capital or operating plans. Capital management strategies could be either asset or financial management decisions. Operating plans are broken down into revenue enhancing and cost minimization decisions. Each of these sub-areas of operations and capital management is represented by two explanatory variables. Most of these variables serve as proxies to growth strategies that collectively capture a set of individual actions performed by the farmer for which no specific farm-level data are available.

Asset Management

Strategies aimed at improving asset productivity levels are represented by two measures: the asset turnover ratio (ATO), calculated by dividing the value of farm production by the adjusted value of total farm assets, and the tenure ratio (TENURE), the proportion of the value of owned farmland to total value of owned and leased acreage. ATO is a collective proxy measure for possible asset purchase and/or sale decisions designed to either improve farm asset productivity levels or eliminate excess capacity. In order to realize higher equity growth rates, obsolete, rarely used farm machineries, for example, need to be replaced due to their high maintenance costs. TENURE, on the other hand, captures the effect of farmland control decisions on business growth. Greater reliance on leasing can increase accounting rates of return and thus,

increase potential growth (Ellinger and Barry, 1987; Purdy, Langemeier and Featherstone, 1997).

The smaller farms in this study are expected to benefit more substantially from these asset management strategies than the larger farms. USDA survey results indicate that farm asset ownership in recent years tends to be more concentrated among small farms (Hoppe, 2001). With average annual gross revenues less than $250,000, these farms could reap more growth benefits from either tapping much of the unutilized productive capacity of their assets or eliminating any idle or excess capacity, or both.

Financial Management

The farm's debt-to-asset ratio (LEVERAGE) and the ratio of interest expense to gross revenues (INTRAT) reflect capital structure decisions designed to promote equity growth.

LEVERAGE captures decisions to reach growth-compatible debt levels and avoid serious financial stress that could result from excessive borrowing. INTRAT represents strategies designed to minimize the cost of borrowing. For example, loan-refinancing decisions could translate to net savings on loan amortization payments. The minimization of the cost of debt is an important condition for realizing the growth contributions of leverage-related decisions. Boessen, et al. (1990) have shown that even farms with higher leverage ratios can remain successful as long as the returns generated from assets consistently exceed the cost of their external borrowings.

Larger farms with more favorable track records in dealing with lenders could have stronger bargaining positions in negotiating for new loans, loan refinancing, and interest rate reduction, either upon loan origination or when restructuring their existing loans. Their greater access to credit, however, could lead to oversized liabilities positions that jeopardize higher equity growth rates.

Revenue Enhancement

Growth opportunities offered by both farm and non-farm sources of revenues will be represented by the farm's ratio of net farm income to gross revenues (NFIRAT) and the level of net non-farm income (OFFARM), respectively. Effective marketing plans, diversification into other farm and auxiliary sources of income (such as sale of forestry products), and reliance on existing and ad-hoc government support could enhance the revenue contributions of the farm business. Moreover, income realized from employment and investment activities outside the farm provide the much-needed supplemental income especially during times of declining farm commodity prices.

Operators of smaller farms often enjoy the flexibility of allocating some of their and their spouses' working hours to non-farm business affairs compared to those that operate larger farm operations requiring full-time work and attention. This is validated by USDA survey results that indicate that the bulk of non-farm incomes have been earned by small farms (Hoppe, 2001).

Cost Reduction

The farm and non-farm components of the cost reduction scheme are represented by the operating expense ratio (OPRAT), calculated as the ratio of total operating expenses (excluding interest and depreciation) to gross revenue, and the level of family living withdrawals (FAMLIV), respectively. Since lower OPRAT values indicate high levels of cost efficiency, its relationship to equity growth is expected to be negative, consistent with the findings of Purdy, Langemeier, and Featherstone (1997). Higher cost efficiency for the farm business could be achieved through such strategies as the adoption of cost-efficient technologies, inputs and production scheduling feasible from the financial, technological, and agronomical standpoints. Minimization of the negative impact of FAMLIV levels would depend on family size and lifestyle preferences. Larger families and greater tendencies to indulge in an extravagant lifestyle could be detrimental to business growth especially during periods of depressed farm incomes.

Descriptive Relationships

The farms included in this study are divided into two data sets according to their four-year average gross revenue levels. Thirty-two (32) farms belong to the smaller size category with average gross revenues below $250,000. Twenty (20) farms

with gross revenues of $250,000 and more belong to the other group of large farms. Within these categories, farms are further classified according to their average annual equity growth rates calculated from 1995 to 1999. Class 1 farms have zero or negative growth rates. Class 2 farms have growth rates between zero and 10%. Class 3 farms have growth rates exceeding 10%. The explanatory variables' four-year mean values are reported in Table 1 for the respective growth classes. Among small farms, increasing asset turnover ratio and net off-farm income tend to be associated with higher equity growth rates while the tenure ratio tends to decrease as equity growth rates increase. For larger farms, net off-farm income is the only variable that tends to form a direct positive relationship with equity growth rates.

Table 1. Four-Year Mean Values of Financial and Demographic Factors, By Size (Gross Revenue) Classes Illinois Grain Farms, 1996-1999

	Small Farms[1]			Large Farms [2]			All Farms
Variables	Class 1 [3]	Class 2 [4]	Class 3 [5]	Class 1	Class 2	Class 3	
Equity Growth Rate (%)	-9.120	4.180	23.500	-7.340	4.630	13.810	7.880
Asset Turnover Ratio	0.270	0.351	0.549	0.381	0.272	0.367	0.389
Tenure (ratio)	0.297	0.146	0.065	0.201	0.226	0.096	0.156
Debt-to-Asset Ratio	0.493	0.334	0.593	0.630	0.287	0.452	0.476
Interest Expense Ratio	0.140	0.053	0.059	0.118	0.038	0.063	0.076
Net Farm Income Ratio	0.114	0.246	0.209	0.102	0.248	0.171	0.187
Net Off-Farm Income ($)	10,638	11,784	14,869	15,778	16,800	30,412	16,401
Operating Efficiency Ratio	0.744	0.615	0.680	0.755	0.577	0.700	0.677
Family Living Expenses ($)	44,445	47,973	43,204	56,933	47,448	50,716	47,120
Number of Farms	9	8	15	5	7	8	52

[1] Annual Gross Revenues of Below $250,000
[2] Annual Gross Revenues of $250,000 and more.
[3] Equity Growth Rates Below Zero.
[4] Equity Growth Rates from Zero to 10%.
[5] Equity Growth Rates Above 10%.

The financing variables, interest expense and debt-to-asset ratios, both form U-shaped relationships with equity growth rates as higher borrowing costs and leverage ratios are observed in the lowest and highest growth classes. These trends confirm the dual nature of the leverage effect on equity growth. For some farms, greater financial stress arising from incremental debt may result in greater financial vulnerability and slower equity growth. On the other hand, increasing leverage may promote equity growth for certain farms that are able to generate business returns that exceed borrowing costs.

In general, the relationships between equity growth rates and the explanatory variables are difficult to discern given the relatively small sample sizes of the classes where one or two observations could significantly influence the mean values of the variables. Hence, we employ panel regression techniques to determine significant linkages between growth and its determinants.

Econometric Analysis

In order to reduce the original set of variables to a smaller batch of significantly important strategies for each category of farms, a backward elimination method under an ordinary least squares regression in SAS was initially performed separately on each of the two panel data sets. This procedure starts with a general regression procedure that considers all eligible explanatory variables. The model undergoes several iterations as one variable after another, identified as one that contributes the least to the model's explanatory power, is dropped from the estimating equation until all remaining variables produce F statistics significant at a specified confidence limit. Based on a minimum confidence limit of 90%, the small and large farm groups had four (4) and five (5) remaining variables, respectively. The small farm model retains ATO, NFIRAT, OFFARM and FAMLIV. Two of these variables, NFIRAT and FAMLIV, are retained in the large farm model along with TENURE, LEVERAGE, and OPRAT.

A time series cross sectional regression method is then applied to the resulting abbreviated estimating equations[2] defined by results of the backward elimination procedure. This study utilizes the Da Silva method (available in SAS) for panel data regression, which is based on a mixed variance-component moving average model.[3]

Econometric Results

Table 2 reports the results of the Da Silva estimation method. For the small farm model, equity growth rates are influenced by revenue enhancement strategies that generate higher farm returns (NFIRAT) perhaps through increased inflows of

government subsidies and the use of effective marketing strategies. This variable also has a significant effect on the equity growth rates of larger farms.

Table 2. Time Series Cross Sectional Regression Results for Abbreviated Models Derived From Previous Results of Backward Elimination Procedure, Illinois Grain Farms, 1996-1999

	Small Farms		Large Farms	
Variable	Coefficient	Prob > /T/	Coefficient	Prob > /T/
Intercept	-0.135788	0.1597	-0.188167	0.4732
ATO	0.448029	0.0001		
TENURE			-0.31069	0.0087
LEVERAGE			-0.206282	0.0531
NFIRAT	0.765945	0.0002	0.745097	0.0192
OFFARM	0.000006632	0.0004		
OPRAT			0.514291	0.1133
FAMLIV	-4.246E-06	0.0025	-1.885E-06	0.043
Model's R2 and Prob>F	0.2967	0.0001	0.2457	0.0001

Net income contributions generated from off-farm sources of employment and investments (OFFARM) also affect the growth rates of the small farms' cost value equity. Notably, this variable's insignificance in the larger farm model is consistent with recent USDA-ARMS survey results (Hoppe, 2001) that indicate the greater incidence of off-farm employment among operators of smaller farms. The regulation of family living expenditures (FAMLIV), attained perhaps through adjustments in lifestyle and expenditure patterns, is another significant variable common to both small and large farm models.

Aside from NFIRAT, OFFARM, and FAMLIV, strategies designed to improve asset productivity levels (ATO) through elimination of excess capacity by either liquidation or replacement of redundant, obsolete, and idle assets, could influence the equity growth rates of smaller farms. This result is again consistent with the structural difference between small and large farms noted in the same USDA-ARMS survey (Hoppe, 2001) whereby smaller farms collectively held 69% of farm assets. An examination of the productive capacity of this high asset concentration among small farms would make ATO-related strategies relevant to attain higher equity growth rates. Among larger farms, two other variables, in addition to NFIRAT and FAMLIV, had significant influences in the larger farm model. The negative coefficient on TENURE suggests that increased farmland control through leasing arrangements, instead of expanding farmland ownership, could have an important influence on the equity growth rates of larger farms. Moreover, LEVERAGE is negatively signed, suggesting that higher equity growth rates are associated with lower debt-to-asset ratios.

Notably, in the larger farm model each component of operations and financial/capital management is represented by the four significant variables. These farms rely on their higher farm sales (NFIRAT) for revenue enhancement, regulate family living withdrawals (FAMLIV) as a cost reduction strategy, utilize leasing strategy (TENURE) to manage asset productivity, and regulate borrowing levels (LEVERAGE) as a financial management strategy. Growth strategies for smaller farms, on the other hand, include complementary farm and off-farm revenue enhancement strategies, cost reduction through controlled family living withdrawals, and management of asset productivity through elimination of excess capacity.

Concluding Notes

The increasing income risk environment during the period 1996-1999 covering most of the 1996 Farm Bill regime provides a convenient setting for the analysis of strategies used by farms to prevent the erosion of the owners' net worth positions. This study provides important insights for farm managers on the interdependence of capital and operating plans for growth for both small and large farms, although these two sets of farms differ in their choices of specific strategies to counter the downward trends in farm incomes occurring during the late 1990s.

In the area of operations management, while both small and large farms are able to effectively realize growth through higher farm business returns and reduced family living withdrawals, the relatively manageable size of farming operations of smaller farms provides enough flexibility for the operators of these farms (or their spouses and other family members) to devote some time to off-farm employment, which becomes an additional significant source of growth for these farms. In contrast, the larger scale of farm operations in the other group of farms requires the full-time attention and commitment of their farm operators and managers. Although larger farms, in general, are able to generate higher average off-farm incomes

than smaller farms (Table 1), the timing and variability of these non-farm cash receipts among smaller farms in each individual year are more conducive to overall business growth as suggested by panel data regression results.

In the area of capital management, small and large farms realize growth through contrasting asset management decisions. The larger asset concentration in smaller farm businesses suggests the importance of strategies that increase the farm's asset turnover ratio (ATO) perhaps through liquidation of idle, obsolete, and unproductive, rarely used farm equipment. Notably, larger farms rely more on expanding farmland acreage control through leasing arrangements given the significance of the TENURE variable in the large farm model. Rural appraisers might corroborate these results with their assessment of productive capacity utilization rates of farms across the country that reinforce this study's contention on the urgency of asset liquidation and replacement in order for smaller farm businesses to grow. Moreover, this study provides evidence on the business growth potential realized from farmland leasing decisions, which does not only confirm this strategy's risk-return tradeoff benefits but also demonstrates an indirect linkage between higher capacity utilization rates and leasing decisions among larger farms.

Financial management strategies designed to regulate leverage ratios are also highly important to larger farms that may have aggressively utilized their credit reserves and borrowing capacity vis-a-vis the smaller farms. The insignificance of both interest expense and debt-to-asset ratios among smaller farms suggests that their current leverage conditions neither are detrimental nor beneficial to business growth.

Regardless of farm size, a farm's growth potential is greatly enhanced by effectively combining operations and capital management strategies. The heterogeneity of structural conditions of small and large farms, however, allows for certain differences in the farmers' choices of growth plans that may adapt well to each farming situation.

Endnotes

1. The Illinois FBFM system defines grain farms as those where the value of the feed fed was less than 40% of the crop returns and where the value of feed fed to dairy or poultry was not more than one-sixth of the crop returns (Ellinger, et al., 2000).

2. Results of diagnostic tests performed on the abbreviated versions of the two farm models indicate the absence of significant heteroscedasticity (chi square values with 10% or higher significance level), multicollinearity (highest condition index numbers of 1.68639 and 7.22453 for small and large farm models, respectively, falling below the critical value suggested by Belsley (1991)) and autocorrelation (durbin watson statistic for small and large farm models falling in the null hypothesis acceptance and inconclusive regions, respectively).

3. The Da Silva panel data regression technique assumes that the error components have cross-sectional and time-series components behaving under a moving average process. The Da-Silva method estimates the regression parameters using a two-step GLS-type estimator (SAS Institute, Inc., 1993).

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