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Analyzing Linkages Between Nursery Farm Growth Rates, Structural Variables, and  
Firm Characteristics

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**Abstract:** Production of ornamental plants is one of agriculture's successes. However, concentration of production and retailing is occurring, bringing additional competitive pressure. An econometric model is used to explain growth rate using a cross-sectional data set from 2001, self-reported growth rates for nursery firms, and firm and operator characteristics.

## **Introduction**

According to the Economic Research Service of the USDA, the nursery and greenhouse industry comprises the fastest growing segment of U.S. agriculture. While the number of farms of all types declined over the last two decades, the number of nursery and greenhouse farms increased. In 1997, the industry had sales of \$10.9 billion, up 43% from 1992. Of 18,860 farms, 650 (or 3.5%) had sales over \$1 million.

The nursery and greenhouse industry is an important economic component of U.S. and Louisiana agriculture. From 1990 to 1998, consumer spending on lawn and garden products jumped from \$20.8 billion to \$30.2 billion, a little over \$1 billion per year. Furthermore, in 1998, it is estimated that 65% of all U.S. households purchased nursery products. These crops represent an important and unique segment of agriculture whose impact is felt at national, state and community levels (ANLA, <http://www.anla.org>).

Nursery and greenhouse crops represent the second most important sector in U.S. agriculture (ERS, 1999). In terms of total farm cash receipts in 1998, the industry ranked seventh nationally, while in Louisiana it ranked eleventh. US nurseries employ about 40,000 full time workers and approximately 105,000 seasonal workers. The nursery and landscape services industries employ over 600,000 workers during peak seasons.

Nursery production in the United States is categorized either as environmental horticulture or as floriculture. Whereas environmental horticulture involves growing trees, shrubs and other plants that are typically grown outdoors, floriculture includes cut flowers, potting flowers and other plants typically grown in a greenhouse environment.

## **Literature Review**

Firm activities, firms, industries and countries as a whole are interrelated. The kind of relationship and its intensity have been evolving. Such relationships, conceptualized as institutional and technological, are closely related to intended aims and socio-economic structure of partners, among others. Nowadays, there is a fast growing integration among firms, industries and countries for a wide array of motives. When integration takes place among firms within industries, vertical integration, or vertical coordination, an important consideration (Rehber, 1998)

It has been widely argued that agriculture is also undergoing a process of vertical integration with allied industries, and that, consequently, control of agriculture in the future may not rest within the industry itself (Trifon, 1959). There will be more reliance on vertical coordination and contract production and producers will be less independent than today's farmer (Harryman, 1994). According to Hobbs and Young (1999), the agri-food sectors of Canada and the United States are witnessing moves towards closer vertical coordination. This is occurring to varying degrees in the different industries, taking on a variety of forms, and involving a diversity of supply chain partners. Some industries, notably the U.S. poultry industry, developed tight vertical coordination some

time ago. In other sectors, it's a relatively recent phenomenon. Nonetheless, while some companies adapt to the new business environment, others lag and eventually exit.

A key element in the performance of a business is related to the type of risks the company is willing to take. Generally speaking, as a company undertakes riskier ventures the firm could get a rate of return higher than the industry's average if everything goes as planned. On the other hand, a firm taking on moderate levels of risk in their ventures may allow the company to receive an acceptable rate of return, but also, if things don't go as planned, it means the firm has less to lose in comparison with another firm that undertakes riskier endeavors. For the agricultural producer, risk comes in various fashions; yield, price, financial, among others. Louisiana nursery firms face a particular form of risk that is associated with the market channel choice. Mass-merchandisers are increasing their market share of nursery products, and producers face the risk of being left out of the growing marketing channel segment. Producers not only must evaluate the different aspects of selling their product, such as price, quantity, and quality, but must also take into account risk levels associated with choosing a particular marketing channel. The large and fastest growing segment, mass-merchandisers, demands more concessions than the other marketing channels. However, it also gives the producer the possibility of growing alongside the retailer. Another option would be to seek alternative marketing channels that would demand fewer concessions and exert less market power, but the growth possibilities are somewhat undermined by the nature of the retailer operations.

Demand assurance, from the producer standpoint, relates to risk in the sense that uncertainty about buyers can induce sellers to seek out different forms of integration to

assure a market. Buyers want assurance of a steady supply of product throughout the production process (Hudson).

The main outlets of nursery products can be categorized as: (i) mass-merchandisers, (ii) garden centers, (iii) other retailers, and (iv) landscapers. However, there are other players in the supply chain, such as re-wholesalers and brokers, who act as the middlemen between producers and sellers. Some retail operations are not exclusively dedicated to nursery products, for example mass-merchandisers. These retail operations carry a wide variety of other products, some of which have a relatively short shelf life and price volatility. This creates an incentive to simplify the way in which business is done with the adoption of new technology. In general terms, some retailers, in particular mass-merchandisers, may be pressuring suppliers of nursery products to adopt new technology as well as other non-traditional means of conducting business. Some examples are: electronic data interchange (EDI), cross docking, continuous replenishment, returnable containers, performance guidelines, and e-commerce. EDI are bilateral electronic exchanges between retailers and their preferred suppliers. These systems may be used only for invoicing or for electronic ordering and other procurement activities (ERS, Agricultural Economic Report Number 795).

The S-290 Regional Research Committee has sponsored three Trade Flows and Marketing Practices surveys, which aim at providing primary information from the nursery industry at the national level (Brooker and Turner, 1990). Nursery growers across the US were asked to provide information on general and specific aspects of their business, for example: type of plants produced, transaction methods used, price determination practices, and advertising expenditures. An essentially similar survey was

conducted again for 1993 and 1998. Of the surveyed firms in Louisiana, about 55.8 % were sole proprietors, 9.6 % were partnerships, and 28.8% were corporations, and there were a few other arrangements. Louisiana nurseries' sales percentage to repeat customers was 73.6 %, 82.6 %, and 78.2 % for the respective years. In 1988, about 81.7 % of sales were not discounted, while that value was 37.8 % in 1993 and 32.5 % in 1998. For all years, over 90 % of sales were wholesale sales. By market channels, 20.4 %, 11.8% and 20.6% was to re-wholesaler clients; 33.9%, 24.5%, and 20.6% was to landscapers; and 45.7% of sales were to retailers. In 1993 and 1998, the retailer category was expanded. In those years respectively, mass merchandisers were the customer for 17.1% and 10.4% of sales, and garden centers received 42.2% and 29.8%. An 'other retailers' category had the remaining sales. Also, 37.8 % of sales were contract sales in 1993, a value that declined to 32.5% in 1998.

Hampton (2001) sought to explain marketing channel choices using business characteristics of nurseries, using pooled data from the 3 surveys. Respondents were stratified by size (large and small). Five limited dependent variable (values could range from 0 to 100) models were estimated. The dependent variables were proportion of sales going to: (i) mass merchandisers, (ii) garden centers, (iii) re-wholesalers, (iv) landscapers, and (v) other retailers. The proportion of sales going to each of the five market channels was hypothesized to be a function of acres, advertising expenditure, age, computerization, contract sales, in-person sales, in-state sales, repeat customer sales, telephone sales, use of four or more channels, and the error term.

The parameter estimates for small Louisiana nurseries' sales to mass merchandisers were not significantly different from zero. The result was expected since

mass merchandisers are not buyers from small producers. On the other hand, the parameter estimates for small Louisiana nurseries' sales to garden centers yielded several significant variables. These were "contracted sales" (a negative impact); "in-state sales" (a positive impact); and "sales to repeat customers", another positive effect. For small nurseries' use of the landscaper channel, only age was significant. One possible explanation is that initially, new nurseries try to maximize sales to garden centers and landscapers because those channels offer the greatest profitability to small growers, and they tend to make less requests for special arrangements. For small nurseries sales to re-wholesalers model, "contract production" had a significant and positive effect, and "in-state sales" had a significant and negative.

For the large Louisiana nurseries' sales to mass merchandisers, the two significant variables were 'contracted sales' and 'use of four or more marketing channels', both positive effects. Hampton suggested that the result implies that mass merchandiser market channel is the one least preferred by growers, because mass merchandisers and growers are not at the same level in terms of market power. For the large nursery garden centers, there were three significant variables: 'computerization', 'contracted sales', and 'in-state sales'. Contracted sales had a negative effect on the percentage of sales going to garden centers because alternative marketing channels are more receptive to contracting than garden centers. In-state sales had a positive impact on the percentage of sales to garden centers because garden centers are generally local businesses, typically in close proximity with the nurseries that supply them. The estimation for the large Louisiana nurseries' sales to "other retailers" and to landscapers revealed little significance. Finally, the OLS estimation for the re-wholesaler marketing channel yielded three significant



variables with negative impacts: 'computerization', 'use of four or more marketing channels' (a diversification strategy on part of growers at the expense of re-wholesalers), and 'in-state sales'.

### **Problem Statement**

In order for the Louisiana nursery industry as a whole to cope with the fast pace of industry change, participants must gain a thorough understanding of the different forces shaping the way in which the different players in the industry do business. With recent changes in the share of nursery products flowing through different market channels, it is important for stakeholders to understand that while some market channels are growing, others are not keeping pace. Specifically, mass-merchandisers are gaining market share at the expense of alternative market channels (Hampton). This observed phenomenon might create potential problems in terms of buyer concentration, for example. Under perfect competition, the large numbers of buyers and sellers would not allow a single market participant to influence other players in the market. However, the situation of many sellers and a single buyer is known as monopsony. The current situation in the nursery industry seems to be in between the perfect competition and the monopsony frameworks, and seems to be moving towards the latter. As concentration among buyers occurs, the issue of market power comes into play. If buyer concentration is high and there are a large number of sellers, the market power balance favors the buyer in the sense they can take advantage of the power gained as a consequence of the structure of the industry itself. According to theory, business in a monopsonistic environment will result in lower prices received by the producers in comparison with the

perfect competition environment. At the same time, the final consumer will not receive any price reductions stemming from the reduced price paid to producers, and retailers will receive a higher share of the “value-added”.

In addition, as the market power of retailers increases, so does their ability to impose conditions on producers, such as the items included in the terms of contract. In general, it is the norm to include price, quantity, and quality specifications in a contract, but retailers with some degree of market power may also include other items, such as transportation to the retail outlet, the use of returnable shipping equipment, a specific time for delivery, or packaging/tagging of products. For instance, in the produce industry, retailers impose a set of “performance guidelines” on their suppliers, which might or might not include the specific items in the terms of contract (FreshTrack 2001).

While few business environments remain unchanged, the Louisiana nursery industry has undergone dramatic change recently, as described above. The question arises “what are the factors or characteristics of a firm that result in some companies being successful while others lag?” The objective of the study is to explain firm growth rates using operator and firm characteristics.

## **Methodology**

The target population for the study is Louisiana’s commercial wholesale nursery firms. The Louisiana Department of Agriculture and Forestry by statute is required to license sellers, and provided the initial list. Very small firms are given a type II license, while firms with over 200 square feet of greenhouse area for production, or 2,500 square feet of nursery farm production space are classified as a type I license. Initially, the latter

group was included in the list of 541. However, some firms having a class one license were too small to be considered commercial growers. Nurseries having less than 1 acre of field production, less than 0.5 acre of container production, or less than 0.04 acres of greenhouse production were removed. Additional firms were removed based on comparison with lists used in the TFMP surveys. Some nursery growers sell their products in their own retail operations, so they were also excluded from the mailing list of the survey. Furthermore, some duplicates were found and deleted. After the different screenings, there were 401 names in the mailing list.

A very important aspect of the study was the development of a survey instrument to collect producer level information on the firm's organization, expenses, revenues, workforce, marketing and technology. In the firm organization section, producers are asked about general characteristics of the firm, such as the acreage devoted to production by product type, and age and legal structure of the business. The sections on expenses and revenues are self-explanatory, although it's important to point out that producers were asked to report sales to the nearest \$1,000 instead of checking a category, as was done in the Trade Flows and Marketing Practices survey. Producers are asked to provide general characteristics of employees. In the marketing section, producers reported their relative use of the different marketing channels and details on the contract terms by channel. The questionnaire was sent by mail to five growers as a pre-test. Some changes were made to make the survey shorter and easier to answer.

The Dillman protocol was used to increase the survey response rate. Initially, a survey packet, consisting of the questionnaire and two letters, was mailed to producers. One letter was from the authors, consisting of a brief introduction and instructions, while

the other was a letter of support from the industry association (Louisiana Nursery and Landscape Association). For producers who had not responded within two weeks, a reminder postcard was sent. Two weeks after the postcard was sent, a second complete set of survey material was mailed to all producers who had not responded to the questionnaire. Given the low rate of response, telephone calls were made to encourage participation. Many questionnaires were returned indicating that the targeted individual or firm had sales lower than \$5,000 a year, or that the nursery sold the products in their own retail outlets. Since those individuals/firms didn't belong to the target population they were deleted from the list, leaving the target population at 352 firms/individuals. Reasons for excluding firms or individuals were similar to previous adjustments to the sampling list. Since it was important to get input from the ten largest nursery growers in the state, those growers were tracked and if they hadn't responded to the survey, additional telephone calls were made in an effort to get them to cooperate. The total number of responses was 63, although many of the respondents didn't fully complete the questionnaire, and 33 responses could be used for the statistical analysis.

### **Theoretical Framework**

Growth of the firm is expected to be a function of buyer concentration ratio, entry/exit barriers, planned expenditures in equipment, and concessions to buyers, size of the firm, legal form of the business, risk propensity/aversion, and education level of the manager.

It is hypothesized that there would be a measurable relationship between the dependent variable 'growth' and the aforementioned set of independent variables. The

variable growth is measured in dollars, and it reflects the increase (decrease) in sales from 1996 to 2001. The choice of asking the respondents to think back five years was made because asking them to remember further back might compromise the validity of their responses, and also, five years in the nursery industry should be plenty of time to capture changes at the firm level. Growth is then a proxy for the firm's success in the industry.

Respondents were also asked to state what percentage of the firm's total sales goes to the biggest four buyers. It is hypothesized that a higher 'buyer concentration' ratio and growth are negatively correlated. The reasoning behind this hypothesis is that a high concentration ratio implies that the grower is heavily dependent on the buyers it currently has. The dependence of the grower with respect to the biggest buyers puts him/her at a disadvantage in terms of market power, giving the buyer the upper hand. In such circumstances where the buyer dictates bargaining conditions it is very difficult for the firm to experience up to par growth, much less above average growth.

The variable 'concessions' was aimed to capture the percentage of total sales in which the nursery has to make concessions to the buyer. The type of concessions that a nursery would have to make in order to realize the sale of their products could include, but is not limited to; "tagging" of the product, including a barcode sticker, transportation to the buyer, price concessions, custom containers, and take-back of unsold merchandise. The variable "concessions" would reflect, to some extent, the market power of the grower relative to the buyer. A low percentage of concessions would mean that the grower has some degree of market power relative to the buyer, whereas a high percentage of concessions would reflect low market power of the grower relative to the buyer.

Although some concessions have to be made in a negotiation, it is hypothesized that there is an inverse relationship between concessions and growth, because ultimately, the concessions the grower makes to the buyer can be thought of as having a cost. This cost is not directly measurable, but it takes away resources from other activities to reallocate them to comply with the buyer.

A variable was constructed for the purposes of measuring exit barriers for nursery firms. Growers were asked to state the selling price of their business under two different scenarios; if they were selling their assets for nursery production, or if they were selling the company for purposes other than nursery production. The difference between selling the firm for nursery operations and for alternative uses should capture the level of investment that is associated with assets and facilities that can only be used for nursery production. In short, how much would a firm lose if it decided to switch from nursery production to alternative uses of resources. This difference is expected to be positive, but there were instances in which this difference yielded a negative number. A possible reason for this negative number might be that over time, the value of dedicating the facilities to alternative uses might yield a higher rate of return, for example, using the land for real-estate purposes. It is hypothesized that the higher the 'exit barriers', the higher the incentives for a firm to grow. This notion of a direct relationships between the two variables stems from the fact that higher exit barriers imply greater risk, giving the firm the incentive to offset this type of risk by diversifying, hiring quality personnel and managers, and in general conducting business in a more professional manner, as opposed to other smaller wholesale nurseries that are managed and worked by family members or just for hobby purposes.

Growers were asked to respond what would be the dollar amount of planned 'expenditures in equipment' for their operations. It is hypothesized that this variable is positively related to growth because higher expenditures in equipment would define reinvestment in the firm, as well as, to some extent, would reflect the replacement of old technology with newer technology, improving productivity and efficiency of the operations.

Respondents were also asked to state if they were 'risk avoiders', 'risk takers' or if they were 'indifferent to risk'. The reference group is the risk takers, while risk avoiders and risk indifferent firms are included in the analysis. The reason to include this variable in the analysis stems from the fact that a person's risk preference is reflected in the management style of that person, and consequently, could be used to portray management style for the firm. The relationship between these different categories is not clear, but in times of economic boom, as in the 90's, risk takers would exhibit higher growth than firms that were indifferent to risk, which at the same time, would do a little better than firms that are risk avoiders and chose a conservative approach to doing business. However, these relationships are not always straightforward and there are many external factors that could influence the outcome of choices regardless of risk preference of managers and/or firms.

Another dummy variable was designed to reflect the form of business organization that the firm has adopted. Corporations were included in one category and all other forms of business organizations were included in the reference group category. Corporations are hypothesized to exhibit more growth because the risk faced by owners in times of financial hardship is reduced. For instance, if a proprietorship went bankrupt,

the debtor answers with his/her personal assets for the debts of the firm, while corporations give the owner some degree of protection to personal assets.

A dummy variable was included to reflect the level of education of managers at the nursery firms. The variable included indicates if managers completed high school, and the reference group includes all subject who has at least a bachelors degree or higher. Firms with managers with a high school degree are expected to grow less than firms with managers with a bachelors degree or higher.

The metric variable size was not included in the analysis because it correlated highly with the variable exit barriers, and it was thought it could be of more value to leave the latter variable in the equation.

## Results

The frequencies and descriptive statistics of the variables in the analysis are shown below. Of 49 firms, 40.8 % were corporations, and the remaining 59.2 % were categorized into other forms of business organization (table 1).

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Table 1. Forms of Business Organization

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	Frequency	Percent
Corporations	20	40.8
Other business organizations	29	59.2

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The manager's education question produced 48 responses. Of those, 47.9 % had a high school degree, and 52.1 % indicated that they had some higher education (table 2).

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Table 2. Education of Firm's Manager

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	Frequency	Percent
Some college or higher	25	52.1
High school degree or lower	23	47.9

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The majority of respondents, 29 people or 59.2%, indicated that they were risk averse (table 3). Of the remaining 20 respondents, 14 indicated that they were indifferent to risk (28.6 %), and only 6 responded they were risk takers (12.2 %).

	Frequency	Percent
Risk averse	29	59.2
Risk indifferent	14	28.6
Risk taker	6	12.2

For the four metric variables used in the model can be seen in table 4. The average for the buyer concentration was 44.91 %, with a standard deviation of 28.29. Average expenditure in equipment was \$12,675.76, average exit barriers was \$302,697, and average concessions was 4.52 %.

	mean	Standard deviation
Buyer Concentration	44.91	28.29
Expenditures in equipment	12675.76	21053.96
Exit barriers	302697.0	529798.34
concessions	4.52	6.29

## The model

A visual check of the histograms comparing observed data value against a distribution approximating the normal distribution of the data didn't indicate strong deviations from normality in the metric variables. An examination of the partial regression plots provided no evidence of non-linearity, and no evidence of heteroskedasticity was found. The variance inflation factor, which measures the degree to

which each independent variable is explained by the other independent variables, indicates that no spurious multicollinearity exists between the variables.

Estimated coefficients and associated t-statistics can be seen in table 6. All tests of significance were conducted at the 0.10 level because of the exploratory nature of the research. Overall, the model's R-square was 0.657, an adjusted R-square of 0.543, and it is significant (table 5).

The variable corporation is significant, with a positive coefficient of 0.279. This result confirms the *a-priori* reasoning that corporations experience 0.279% more growth, on average, than other types of business organizations. Also, the variable exit barriers is significant and positively related to growth with a coefficient of 0.569. It follows that with higher exit barriers, implying higher risk, encourages better managerial preparation and utilization of resources. Also, since there is an association between higher exit barriers and size, it may be possible that the variable high exit barriers also includes, to some extent, effects associated with economies of scale.

Table 5. Model Summary.

R	R square	Adjusted R square	Std error of the estimate	Change statistics		
				df1	df2	Sig. F change
.811	.657	.543	82958.44	8	24	0.000

- a. Predictors: (constant), concessions, expenditures in equipment, buyer concentration, exit barriers, corporation, high school, risk averse, risk indifferent  
 b. Dependent variable: growth

Expenditure in equipment is positively related to growth with a coefficient of 0.198, but it is not significantly different from zero. Along with this, buyer concentration is negatively correlated to growth by  $-0.091$  and non-significant.

The positive coefficient for the variable concessions was anticipated to be negative. However, the average concession for the sample is around 4.52 %, which is not an excessive burden for growers to cope with. Nevertheless, the variable is not different from zero. On a different plane, the variable high school is not significant, but it exhibits a positive coefficient, meaning that firms that have managers with a completed high school education have 0.49 more growth than the reference group. In this case, the reference group consists of managers with a bachelors degree or higher.

Table 6. Regression Results and Coefficients.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics
	B	Std. error	Beta			VIF
(constant)	-9200.1	532873.2		-.173	.864	
Corporation	68309.8	32460.4	.279	2.104	.046	1.234
High school	11974.9	31277.1	.049	.383	.705	1.146
Risk averse	17440.9	45786.9	.068	.381	.707	2.234
Risk indifferent	58667.8	52738.3	.198	1.12	.277	2.229
Buyer concentration	-396.7	565.0	-.091	-.702	.489	1.188
Expenditures in equipment	1.16	0.83	.198	1.401	.174	1.404
Exit barriers	0.132	0.03	.569	4.003	.001	1.416
concessions	1222.6	2535.1	.063	.482	.634	1.181

Finally, an observation of the results for risk preference shows that the ‘risk takers’ reference group experienced less growth relative to the other two categories of risk preference. Risk avoiders and risk indifferent firms grew, on average and everything else kept constant, by 0.068 and 0.198 respectively. Again, both of these variables are non-significant.

## Summary

This study aimed at explaining growth rates experienced by Louisiana ornamental nurseries in terms of different characteristics of the firms. Only two variables were

significant at the 0.10 level; corporations and exit barriers. The variable corporations shows that, on average and everything else held constant, corporations grow more than other legal forms of business organization. Also, the analysis shows that exit barriers positively impacts growth rates.

Other variables are not significant, but a reason for this might be the lack of power given the small sample size. Further research with a greater sample size could help shed some light on the effect of non-significant variables, as well as might allow for other possible variables to be included in the analysis.

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