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Improving rural business development, one firm at a time: A look at the effects of the USDA's Value-Added Producer Grant on firm survival

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Improving rural business development, one firm at a time: A look at the effects of the USDA's Value-Added Producer Grant on firm survival

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DEDICATION

I would like to dedicate this thesis to all of my educators in life. From early childhood to the present, you have all instilled a love of learning in me that I will continue to carry with me. It is this love that pushed me to pursue further education and for that I am forever grateful. Though I greatly value all that I have learned from my most formal of educators, it goes without saying that my parents, Terry and Mary Stevenson, and grandparents, John and Marilyn Stevenson and Hub and the late Dorothy Hughes, have been some of the best educators in my life. Without them, I would not be where I am today.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

NOMENCLATURE

D&B	Dun & Bradstreet
DUNS	Data Universal Number System
GRP	Gross Regional Product
NAICS	North American Industry Classification System
NETS	National Establishment Time-Series
NOFA	Notice of Funds Availability
USDA	United States Department of Agriculture
VADG	Value-Added Agricultural Product Market Development Grant
VAPG	Value-Added Producer Grant

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ABSTRACT

The rural economy has been declining over the past decade and a half. With the removal of farm subsidies, the U.S. Department of Agriculture has been looking for ways to help these suffering economies throughout the U.S. In 2001, under the supervision of the USDA's Rural Business-Cooperative Service, the Value-Added Producer Grant program was established to help aid and support independent producers and similar organizations who are directly involved in the production of value-added agricultural products. Economic studies of firm survival suggest that capital acquisition and asset fixity are some of the biggest challenges facing start-up firms today, especially in rural areas where venture capital is limited. By utilizing information on Value-Added Producer Grant recipients from 2001 to 2011 in Iowa and North Carolina coupled with National Establishment Time-Series data from 1990 to 2011, this study will be using survival analysis to determine the effects of the USDA Value-Added Producer Grant on firm survival. Recipients will be matched with similar, non-recipient peers that represent the plausible outcome of the recipient firm had they not received the grant. The difference in length of survival time will measure the effect of the grant on firm survival.

The results of the study show that for both start-up and established firms, receiving a VAPG had a positive and significant impact on firm survival length. The value of the first grant received, conditional on having received a VAPG, as well as the total value of all grants received (in $100,000 increments) increases the estimated survival times though the size effect is not statistically significant. The estimated time ratios for the effect of the grant on firm survival varied greatly between the models suggesting that the grant may have different impacts on firm survival depending on the maturity of the business. Further evaluations were completed to

determine if the control groups established within the study represented a good match to the treatment firms. Using probability estimation, we determined that grant selection, conditional on the matching process for the study, appeared to be approximately random.

CHAPTER I

INTRODUCTION

Over the past decade and a half, rural economies across the United States have been declining largely due to their ties to the agricultural industry. The U.S. Department of Agriculture, as a part of their mission, has taken interest in preserving these rural economies. As of recently, the Department has been looking to value-added agriculture as a means for helping to support these declining regions (Kilkenny & Schluter, 2001). Farm subsidies were previously used as a rural development strategy, but left much to be desired. These subsidies favored larger farming operations leading to increased farm sizes, a decline in the number of farms, and fewer individuals involved in production agriculture. These subsidies, ultimately, did not achieve their goal of improving the rural farm economy.

Value-added agriculture has the potential to aid in the development and revitalization of rural economies across the United States. Though the definition of value-added agriculture can vary, studies are beginning to show some of the impacts these new agricultural systems included in value-added agriculture are generating. Revenues from value-added agricultural operations and activities are many times distributed within the communities nearest to the operation (Drabenstott & Meeker, 1997). These operations have the ability to increase local economic growth through linkages to other business and potential job creation (Monchuk, 2006). Producers of value-added agriculture products have increased risks, yet are typically rewarded with higher profits than their commodity producing peers (Brees, Parcell, & Giddens, 2010).

The USDA Value-Added Producer Grant, which focuses on supporting independent producers and similar producer groups involved in value-added agriculture operations, was

created in 2001 as a competitive grant program. The USDA Rural Business-Cooperative Service administered the grant program to help achieve the Service's goals of increasing rural business development. Later, the program was introduced formally to the 2002 Farm Bill were funding priorities were established.

Economic literature on firm survival suggests that age, location, and capital acquisition are key determinants of firm success. This is no different for firms involved in agricultural operations. Younger firms are susceptible to a higher risk of failure relative to established firms (Caves, 1998). Within the first five years of operation, roughly 50 percent of firms will fail or exit the market (Dunne, Roberts, & Samuelson, 1989). Metropolitan regions naturally appear to be the more ideal location for start-up firms given the proximity to essential resources (Renski H. , 2008).One of the biggest challenges that rural start-ups face is access to capital, leaving them worse off relative to their urban peers who can more readily access and utilize capital to develop and grow their firms (Renski & Wallace, 2013). Rural firms also face the issue of asset fixity which requires a firm to have a higher probability of survival before entering a market given that the assets are less likely to be transferred to another firm and therefore, will have a lower salvage value or increased losses from failure relative to urban peers (Yu, Orazem, & Jolly, 2009). These issues dampen rural business development. However, there is evidence that rural firms survive longer than firms in urban regions (Stearns, Carter, Reynolds, & Williams, 1995; Yu, Orazem, & Jolly, 2009). Reducing the barriers to entry for rural start-ups can boost local economies for many years as the firm becomes more stable over time.

Given that the USDA Value-Added Producer Grant program is one form of capital acquisition for rural firms, this study looks to evaluate the impact the grant has on firm survival. Utilizing data on grant recipients from Iowa and North Carolina between 2001 to 2011 along

with National Establishment Time-Series data from 1990 to 2011, recipient firms will be matched with similar peer firms within the time-series data to create control groups. These control groups will aid in determining the effect of the grant on firm survival using the survival analysis method as they represent the probable case for the recipient firms' survival had they not received a grant. The survival analysis is based on receiving a grant (a form of capital acquisition), as well as firm specific characteristics like size and location.

Results from our study suggest that receiving a grant has a positive and significant impact on firm survival, especially start-up firms. The more money a firm received, both from their first VAPG and from all VAPG's, the longer the firm survived, although conditional on receiving a grant, the size of the grant did not significantly increase firm survival. Receiving a relatively small (planning) grant did not have a significant effect on survival. Further evaluations were done to determine if the established control group represented good matches for the treatment group. We estimated the probability of firms in the dataset receiving a VAPG, conditional on the matching process, and results suggest that, though small and medium sized firm are more likely to be selected, recipients of the grant are approximately randomly selected with some preference for those who appear to be most successful. Other results from this study begin to provide some direction for areas of future research related to the grant program and firm survival. For example, future research might further explore the influence of the VAPG program on firm survival across different industries, the effects of differing funding levels, and the impacts on job creation.

CHAPTER II

LITERATURE REVIEW

2.1 Value-Added Agriculture

To increase both rural development and agricultural entrepreneurship, many have been looking to value-added agriculture (Coltrain, Barton, & Boland, 2000; Kilkenny & Schluter, 2001; Womach, 2005). In the past, rural farm subsidies were viewed as an avenue for rural development. However, these farm subsidies were largely based on farm size, encouraging producers to seek low-cost methods and obtain economies of scale. In order to achieve economies of scale, many farmers were pushed to consolidate, leaving a smaller rural population than before. Ultimately, farm subsidies did not achieve the goals of rural development as the number of jobs in agriculture and rural communities fell (Schenheit, 2013).

The role of value-added agriculture has been increased and promoted during the last few years given the weakening role of production agriculture as well as increased job loss and reduced workforces in rural areas (Clemens, 2004). Studies have been conducted on value-added agriculture as a development strategy for rural areas, especially those involved highly in agriculture. One study of county level economic growth factors in the Midwest indicated that more economic growth stemmed from farmers who engaged in value-added livestock production that their peers who did not (Monchuk, 2006). Additionally, increased revenues are distributed throughout the community from value-added agricultural operations (Drabenstott & Meeker, 1997). Counties with greater reliance on agriculture displayed less growth than those with less reliance, except for those counties which had a greater share of valued-added agriculture (Monchuk, 2006).

Value-added agriculture can be viewed in two different ways. First, the "typical" form of value-added agriculture consists of raw product processing (Coltrain, Barton, & Boland, 2000; Amanor-Boadu, 2003). In order to create more value, one must complete an activity that would have otherwise occurred farther down the processing chain after leaving the producer (Brees, Parcell, & Giddens, 2010). Typically, some degree of vertical integration can be seen in value-added agriculture. Increased vertical coordination boosts the farm's ability to decrease farm-to-retail price spreads through the integration of production, processing, and sometimes, retail. This can increase profits, but also leads to more risk falling onto the producer (Schenheit, 2013).

Second, the concept of value-added agriculture has recently expanded to include particular characteristics of goods which set their identity apart from other similar goods, such as local or organic labels (Womach, 2005; Ernst & Woods, 2011; U.S. Department of Agriculture Rural Business-Cooperative Service, 2015). Local foods have become ever more popular among consumers and producers as a means of value-added agriculture (Liang, 2015; Woods, Velandia, Holcomb, Dunning, & Bendfeldt, 2013; Hardesty, 2010; Onken & Bernard, 2010). Many farmers and consumers prefer local foods due to the mutually beneficial relationship that is built. Farmers are able to receive a premium from their customers' preferences and consumers are able to have their specific preferences met which may include knowing the source of the product (sometimes down to the farmer level.) This relationship gives value-added agriculture producers a competitive advantage over their commodity producing peers (Born, 2001; Brees, Parcell, & Giddens, 2010).

Competitive advantages can be gained by being the lowest-cost producer, the most consistent producer or being the first to market with a new practice. Such advangtage helps the farmers to gain increased income and profitability. (Born, 2001; Brees, Parcell, & Giddens,

2010). By partaking in value-added agriculture, the producer weighs their potential for increased profits against their increased risks. Producers who engage in "new" value-added agriculture activities, where consumers prefer a particular trait, generally have decreased risks relative to those producers who are more focused on "typical" valued-added agriculture activities, where value shifts within the production sequence (Brees, Parcell, & Giddens, 2010).

Given that a variety of groups including farmers, policymakers, funders, and researchers are involved in value-added agriculture in some manner, the need for a consistent definition can be seen, especially when working on funding projects (Lu & Dudensing, 2015). However, many definitions for value-added agriculture exist today and are often inconsistent with one another. For example, the United States Department of Agriculture (USDA)'s definition of value-added agriculture focuses heavily on the revenues received by the producers. Others, such as economists and policymakers may be more likely to define value-added agriculture by the firm's input into the gross regional product (GRP). Smaller, more rural communities may benefit from these increases in GRP as the local value chain now receives extra income relative to other agricultural systems where processing of raw commodities is conducted outside of the region, redistributing the value from the producers to the processors. Differing definitions for value-added agriculture can hinder the ability for unified goals and analysis for the success of programs and policies related to value-added agriculture. (Lu & Dudensing, 2015).

2.2 USDA Value-Added Producer Grant

One of the many grants that supports value-added agriculture is the Value-Added Producer Grant (VAPG). The VAPG is a competitive grant administered through the USDA's Rural Business-Cooperative Service to aid and support value-added agricultural operations. The

grant program aids farmers and ranchers, as well as similar groups and organizations, involved in value-added agriculture enterprises by providing funds for the planning and capital investment of such operations (Leval, Tuttle, & Bailey, 2005). The VAPG is one of the many programs that the USDA Rural Business-Cooperative Service employs to achieve their mission of supporting rural business development. The government has maintained the rural economy as a priority since the 1950's.

Federal and state governments have continued interests in rural business development as a strategy for rural development (Kilkenny & Schluter, 2001). While agricultural employment in rural communities has declined dramatically over the past half century, agriculture remains an important driver in rural regions of the United States. As a result, policies that promote the development and flow of capital to the agricultural sector are viewed as a logical and effective strategy for rural business development (Van Auken & Carraher, 2012). The VAPG was established with the objective of aiding independent producers, producer groups, farmer or rancher cooperatives, and majority-owned producer businesses in the development of business plans and marketing opportunities into new or emerging markets (Young, 2006).

2.2.1 Grant establishment

In 1998, *A Time to Act*, a report by the USDA National Commission on Small Farms was released. Within the pages of the report, the Commission outlined suggestions on how the USDA could further their efforts in the promotion of value-added processing and marketing of goods from small farmers and ranchers. One of the main recommendations was the creation of new programs specifically targeting the enhancement of value creation within and on small farms so as to allow the producers an opportunity for increased profits (National Commission on Small

Farms, 1998). The USDA implemented their first program, the Value-Added Agricultural Product Market Development Grant (VADG) in 2001 as a part of the Agricultural Risk Protection Act of 2000 code 231(a), a crop insurance reform bill. For the first time, $10 million was provided to fund grants for value-added agricultural activities (Rural Business-Cooperative Service, 2001).

The VADG program was administered by the USDA Rural Business-Cooperative Service (Rural Business-Cooperative Service, 2001). Later, another round of funding, consisting of an additional $10 million, became available from an emergency supplemental appropriation bill. The initial $20 million provided grants received during 2001 and 2002 (Leval, Bailey, Powell, & Tuttle, 2006). During this time, the grant funds could be used in two different ways: (1) develop a business and marketing plan for a product or (2) investment in value-added business activities which enhance the producer's ability to compete in the market (Rural Business-Cooperative Service, 2001). The VADG program became the USDA Rural Development's first initiative to focus on value-added activities helping them to make further strides in achieving their mission to "improve the economy and quality of life in all of rural America (U.S. Department of Agriculture Rural Development, n.d.)."

2.2.2 Grant changes and revisions

Though the program was first established in 2001, it was not until May 2002 when the Farm Security and Rural Investment Act (2002 Farm Bill) was passed that the program was formally included in legislation (Hunt, 2002). Under the 2002 Farm Bill the program was formally renamed the Value-Added Producer Grant (VAPG) program. In order to be included in the 2002 Farm Bill, details of the grant needed to be better defined, including the definition of a

"value-added product." The initial definition given in the 2001 Notice of Funds Availability (NOFA) was solely focused on the processing of a product in which the value therefore was increased (Rural Business-Cooperative Service, 2001). Once placed in the Farm Bill, the definition was expanded to include three different dimensions of "value-added" which include:

i. a change in the physical state of form of the product (such as milling wheat into flour or making strawberries into jam);
ii. the production of a product in a manner that enhances its value, as demonstrated through a business plan (such as organically produced products);
iii. the physical segregation of an agricultural commodity or product in a manner that results in the enhancement of the value of that commodity or product (such as an identity preserved marketing system) (Rural Business-Cooperative Service, 2002).

This grant program was seen as a way to improve coordination between economic development and farm subsidies, improve producer incomes and profits, build rural amenities, and to increase rural employment opportunities. Relative to other competitive grants, the VAPG was unique given that the money awarded could be utilized to pay for a variety of expenses the firms may have ranging from labor to marketing expenses and working capital. One exception to the use of funds is that it cannot be used for certain types of physical infrastructure such as buildings. The idea behind the grant was to promote smart business investments while reducing the amount of risk and uncertainty taken on from these investments (Boland, Crespi, & Oswald, 2009). Priority was given for funding the VAPG in the 2002 Farm Bill for the first time as well (Rural Business-Cooperative Service, 2002).

Since 2002, the VAPG has undergone a number of changes and revisions ranging from a reduction in the maximum grant amounts to changes in eligibility criteria. Over this time though, the grant has maintained its goal of increasing producer profitability and aiding market expansion. More recently, preferences have been introduced which reflect more urgent categories for funding projects such as bio-based projects like manure digesters (Schenheit, 2013).

From 2001 to 2004, there was only one type of VAPG and the maximum funding level was $500,000 (Rural Business-Cooperative Service, 2001; Rural Business-Cooperative Service, 2002; Rural Business-Cooperative Service, 2003; Rural Business-Cooperative Service, 2004). In 2005, two types of grants, a planning grant and a working capital grant, were created to better focus grant dollars. The planning grant had a maximum grant amount of $100,000 while the working capital grant's maximum amount was $150,000 (Rural Business-Cooperative Service, 2005a). Maximum grant amounts for the working capital grant were increased to $300,000 from 2006 to 2012[1] while planning grant limits remained unchanged (Rural Business-Cooperative Service, 2005b; Rural Business-Cooperative Sevice, 2007; Rural Business-Cooperative Service, 2008; Rural Business-Cooperative Service, 2009a; Rural Business-Cooperative Service, 2009b). In 2014[2], both grant types saw a reduction in funding as planning grants were limited to $75,000 and working capital grants at $200,000 (Rural Business-Cooperative Service, 2013). For 2015, and currently in 2016, the maximum funding level for planning grants has remained stable while the maximum funding level for working capital grants have been increased to $250,000 (Rural Business-Cooperative Service, 2015; Rural Business-Cooperative Service, 2016).

[1] Due to NOFA posting errors, 2009 grants were not awarded until 2010. Additionally, due to budgetary issues, 2011 and 2012 grant payments were bundled.
[2] Once again, budgetary issues delayed the payment of grants and 2013 grant dollars were combined with 2014.

When the grant was first developed very few priorities for who should receive the grants were made. Over time, as the grant has evolved and become more refined, preferences and special emphases have been developed to award particular groups a larger share of the grants. These groups include beginning, socially-disadvantaged, and veteran farmers as well as tribal groups. Additionally, the definition of a value-added product has continued to evolve, slowly becoming more descriptive and targeting certain types of value-added agriculture. The current definition now has five dimensions versus the 2002 Farm Bill version which had just three. Many of these changes have been made through public comments during open comment periods as well as through the direction of the presiding President's initiatives. Further details about changes made to the VAPG between 2001 and 2016 can be found in Appendix table A.1.

2.2.3 Current application requirements

The most recent VAPG NOFA is for fiscal year 2016. The notice invites applications from independent producers, agricultural producer groups, farmer and rancher cooperatives, and majority-controlled producer-based businesses. Grant funding priorities currently include producers with small and medium-sized operations, especially those operating as a family farm or ranch. Ten percent of funds are reserved for beginning, veteran, and socially-disadvantaged farmers or ranchers. Another ten percent is held for producers proposing projects which develop mid-tier value chains[3]. Grant funds can be used for starting or expanding processing or

[3] The definition of mid-tier value chains as defined by the 2009 Notice of Funds Available released by the USDA's Rural Business-Cooperative Service is as follows: "Local and regional supply networks that link independent producers with businesses and cooperatives that market Value-Added Agricultural Products in a manner that—
(1) Targets and strengthens the profitability and competitiveness of small and medium-sized farms and ranches that are structured as a family farm; and
(2) Obtains agreement from an eligible Agricultural Producer Group, Farmer or Rancher Cooperative, or Majority-Controlled Producer-Based Business Venture that is engaged in the value chain on a marketing strategy.

marketing initiatives for value-added agricultural products (Rural Business-Cooperative Service, 2016).

The current definition of a value-added agricultural product is:

(1) The agricultural commodity must meet one of the following five value-added methodologies:

i. Has undergone a change in physical state;

ii. Was produced in a manner that enhances the value of the agricultural commodity;

iii. Is physically segregated in a manner that results in the enhancement of the value of the agricultural commodity;

iv. Is a source of farm- or ranch-based renewable energy, including E-85 fuel; or

v. Is aggregated and marketed as a locally-produced agricultural food product.

(2) As a result of the change in physical state or manner in which the agricultural commodity was produced, marketed, or segmented:

i. The customer base for the agricultural commodity is expanded and

ii. A greater portion of the revenue derived from the marketing, processing, or physical segregation of the agricultural commodity is

(3) For Mid-Tier Value Chain projects the Agency recognizes that, in a supply chain network, a variety of raw agricultural commodity and value-added product ownership and transfer arrangements may be necessary. Consequently, applicant ownership of the raw agricultural commodity and value-added product from raw through value-added is not necessarily required, as long as the mid-tier value chain proposal can demonstrate an increase in customer base and an increase in revenue returns to the applicant producers supplying the majority of the raw agricultural commodity for the project."

available to the producer of the commodity (Rural Business-Cooperative Service, 2016).

Planning grants can be awarded with amounts up to $75,000 and used for the development of planning activities in order to conclude if a value-added venture is viable. Specifically, planning grants can be used to carry out a feasibility study, design a business plan or to create a marketing plan for a value-added agricultural product. Working capital grants can fund up to $250,000 with monies being used on operations related to the value-added product or project. These funds should be utilized to cover expenses aiding processing activities as well as fulfilling marketing strategies. All grant funds received through the VAPG program require a $1 to $1 match from the recipient (Rural Business-Cooperative Service, 2016).

2.3 Previous Analyses of the USDA VAPG

Few others have researched the United States Department of Agriculture's (USDA) Value-Added Producer Grant (VAPG). Leval, Bailey, Powell, and Tuttle (2006), on behalf of the Center for Rural Affairs, conducted a comparison of VAPG program funding relative to three other USDA grant programs by measuring the number of projects funded and the quality of the projects funded based on the VAPG application. The report concluded that the VAPG did a better job than the three other grants at targeting small and medium-sized farmers and ranchers (Leval, Bailey, Powell, & Tuttle, 2006).

Another study of the VAPG was done by Boland, Crespi, and Oswald (2009) and updated by Schenheit (2013). In this particular study, they found that large firms are more likely to receive a grant and receive a greater proportion of these grants than small firms. Larger grants went to existing firms who were looking to diversify by expanding into new, value-added

markets. Their findings suggest that when an existing firm chooses to expand they have good information and knowledge about the market they are pursuing. Such knowledge is used to determine market potential before entering. Very few new firms were given grants of similar size, but rather received smaller grants. Additionally, some states have designated job positions to help with business development and feasibility studies before smaller firms apply for a VAPG to help them compete against the larger, existing firms (Boland, Crespi, & Oswald, 2009).

The main purpose of these studies was to determine the impact of business success in terms of growth through nine start-up business steps (Boland, Crespi, & Oswald, 2009; Schenheit, 2013). In both studies, no control groups were implemented to determine a benchmark when evaluating for success. For our study, in order to better measure the impact of the VAPG funding on business success, we have matched recipient firms to similar firms who did not received a VAPG in order to create a benchmark for determining what would have likely occurred if the recipient had not received the grant. Our study then utilizes these control groups to determine the effect of the grant on the survival of the recipients relative to their non-recipient peer group. If the grant is effective, we would expect for the VAPG recipient firms to survive longer than their peer group. Currently, none of the existing studies of the VAPG program have assessed the impact of funding on firm performance by assessing how the funding impacts firm survival.

2.4 Firm Survival

A firm's survival rate is the probability that a firm survives over a given period of time and is driven largely by market attributes and individual firm characteristics. Additionally, the survival of a firm may also be based on the stage of development the firm is in, which may be

affected by the market as well as by the factors which link entry, exit and survival to the market (Agarwal & Gort, 1996).

Survival analysis has been utilized to study the survival of firms. Datasets which are capable of such analysis are hard to come across or create (Risch, Boland, & Crespi, 2014). Results from a number of survival analysis studies propose that larger, older firms tend to survive longer relative to smaller, newer firms (Disney, Haskel, & Heden, 2003). Hazard rates, the probability of a firm failing, are the highest when a firm is new, operating as a start-up, versus when older and producing closer to their minimum efficient scale (Audretsch & Mahmood, 1995).

2.4.1 Age

Studies have shown that firm risk decreases as the firm ages (Dunne, Roberts, & Samuelson, 1989; Audretsch D. B., 1991; Baldwin & Gorecki, 1991). Age is closely related to the stage of development. Firms who are active in the market longer are more likely to learn and observe the true costs of remaining in that market while also increasing their efficiency. This decreases their risk of failure (Jovanovic, 1982). Younger firms are exposed to higher levels of risk, especially during their first few years (Geroski, 1995; Caves, 1998). A variety of studies covering different industry sectors across numerous countries have revealed that within the first five years of operation more than 50 percent of new firms are likely to fail (Dunne, Roberts, & Samuelson, 1989; Geroski, 1995; Audretsch, Santarelli, & Vivarelli, 1999).

Established firms are not immune to risk and failure. Typically, established firms have a higher probability of surviving, but they must still overcome economic shocks such as changes in the industry like new technologies (Utterback & Abernathy, 1975; Gort & Klepper, 1982). By

taking on innovative activities and strategies, established firms are able to combat some of these market changes and will improve their capabilities (Banbury & Mitchell, 1995; Christensen, 1997).

2.4.2 Location

Another factor affecting firm survival is firm location. Generally, rural business development theory has suggested that metropolitan areas favor entrepreneurship more so than rural areas. Within these metropolitan areas, firms are able to create niche markets for themselves by utilizing new technologies or tapping into specific preferences of the consumer base (Hoover & Vernon, 1959; Leone & Struyk, 1976; Renski, 2008). New firms are highly susceptible to the local economic environments and markets (Renski & Wallace, 2013).

Rural regions tend to have lower financial costs as well as non-monetary costs relative to larger cities (Atkinson, 2004). Similarly, these rural regions can easily leverage their natural resources in order to attract new firms (Drabenstott, 2003). However, rural areas are subject to limited local demand from smaller consumer bases, lack of crucial services or supporting organizations, seclusion from bigger markets, and absence of specialized infrastructure. These factors represent some of the barriers to entry for new firms in rural locations (W.K. Kellogg Foundation & Corporation for Enterprise Development, 2003). Given the disadvantages that rural regions seem to be faced with, it could easily be anticipated that new firms would be more attracted to the advantages of an urban setting and choose to locate in these markets rather than more rural markets (Renski H. , 2008). Therefore, one could say that urban areas have an advantage over rural areas (Monchuk, 2006).

Survival rates of new firms by geographical location has been studied very little. Those who have delved into this area of research suggest that there is very little difference between survival rates of new firms between urban and rural areas (Reynolds, 1987; Buss & Lin, 1990; Forsyth, 2005). Stearns, Carter, Reynolds and Williams (1995) on the other hand find that rural firms have increased survival rates relative to urban firms. Similar results have been echoed by Yu, Orazem, and Jolly (2009) who found that rural firms have a 25 percent advantage for survival over their urban peers.

2.4.3 Capital acquisition

A number of studies have shown that lack of access to capital is one of the biggest challenges that start-up entrepreneurial firms face (Markley, 2001; Barkley, 2003; Wiklund & Shepherd, 2003; Rubin, 2010). The acquisition of capital for new firms plays a significant role in business operations, risk, and the firm's overall performance (Cassar, 2004). Securing capital for new firms may be tricky, especially in rural areas, as banks tend to prefer lending to less risky firms with stable revenue streams (Renski & Wallace, 2013). Acquiring external funding can be costly for new firms as they must fulfill the requirements of the private lenders. Some firms, therefore, choose to operate with internal funds only given the extra cost and effort needed to obtain external funding when the amount sought may be quite small relative to this premium (Holmes, Dunstan, & Dwyer, 1994; Stouder & Kirchoff, 2004). Lack of capital can put firms at a disadvantage relative to other, more adequately capitalized firms in the market (Wiklund & Shepherd, 2003).

Compounding the problem of acquiring adequate capital during the start-up or expansion phases, rural firms may also face an asset fixity problem. Yu, Orazem, and Jolly (2009) pitch

asset fixity as a plausible cause for longer survival of rural firms. Because of thinner markets for capital assets in rural areas, rural firms have a lower expected salvage value relative to urban peers and therefore, have increased barriers to exit. If a rural firm fails, or decides to exit, it will have a harder time selling fixed assets or finding a successor than would an urban firm. As a result, the expected salvage value of the firm at the time of entry is lower in rural areas. These large investments with low salvage values can be viewed as a sunk cost (Johnson & Quance, 1972; Abel & Eberly, 1994; Chavas, 1994). Rural firms must in turn have a higher probability of success to justify the investment in the firm (Yu, Orazem, & Jolly, 2009)[4]. Asset fixity occurs most frequently when an asset is designed to use a very specific input or for limited production and cannot be easily adapted for use with other inputs or for the production of other goods. These constraints create barriers to exit for firms investing in assets as the salvage value of the asset diminishes quickly once the good or input is no longer demanded or readily available. These are assets which typically cannot be sold or transferred (Williamson, 1979).

Chambers and Vasavada (1983) empirically tested the hypothesis of asset fixity, but there was no significant empirical support. Though the hypothesis was not supported, their study changed the way many researchers viewed capital formation. In 1999, Ward and Hite linked the lack of autonomous rural development across regions with asset fixity (Ward & Hite, 1999). Slow exit rates for farmers in the dairy industry were explained using asset fixity by Foltz (2004) while the same explanation was used by Boetel, Hoffman, and Liu (2007) to explain the delayed response of hog production to changes in pork prices. The ethanol industry was studied by Wlodarz (2013) who concluded that one of the major barriers to ethanol production was asset

[4] Johnson (1956) proposed this idea to explain the overproduction of commodities during the 1950's and 1960's even though many farmers were facing economic losses.

fixity given the limited ability to utilize production facilities or convert assets to handle different inputs after failure of the initial operation.

Firms in rural regions who are faced with asset fixity must evaluate the expected losses from failure, which is largely a function of the salvage value of the assets. In urban regions, where markets are thicker, firms are less prone to asset fixity and therefore, marginal firms will enter the market knowing that there are more opportunities for liquidating assets. Rural peers have a more difficult time moving these assets between firms given the location and costs to move. In order to combat the issue of asset fixity, policies should be developed to help lower costs of entry into rural markets to offset firms for low salvage values if the firm fails (Yu, Orazem, & Jolly, 2009).

Funding grants and forms of lending require matching characteristics of firms with the requirements of funders. This can be a difficult process for small firms, especially those in rural areas, as they do not always fit the requirements (Richards & Bulkley, 2007). Rural America has always consisted of deeply rooted family owned businesses, sometimes for multiple generations. Due to this nature, funders may be less likely to provide capital to these firms as their exit strategies do not align with that of the funders, which typically include options for corporate acquisition or public offerings (Markley, 2001). Niche agricultural markets can help to alleviate some of these funding issues as the producer has the ability to leverage a variety of characteristics for higher income given consumer preferences which include quality, locality of production, history or heritage, and superior craftsmanship (Dabson, 2001).

Federal, state, and local governments and development organizations, as well as private agencies, have made efforts to boost capital acquisition for rural firms, especially those in niche sectors through the funding of projects (Kilkenny & Schluter, 2001). Even with these efforts,

many rural areas are still being highly underserved (Goreham, 2005). Korsching and Jacobs (2005) stated that these institutions and agencies are needed to help improve the flow of capital into such rural regions and firms. When producers of niche products receive capital, these producers are better off than without such capital. This in turn has a larger effect on the rural communities in which these firms are located, aiding more than just the firm originally funded (Van Auken & Carraher, 2012).

Studies which have used survival analysis in economic research have varied greatly. Esteve-Perez and Manez-Castillejo (2008) determined through their study that research and development, advertising, and age are all related to the amount of risk a Spanish manufacturing firm has. Holmes, Hunt and Stone (2010) studied variables which impact UK firm survival including plant size, exchange rates, and interest rates. The survival of U.S. banks was studied by Wheelock and Wilson (2000). Audretsch and Mahmood (1995) incorporate establishment-specific features into a previous study using a hazard function with the conclusion that these characteristics play an important role in determining an establishment's risk. In 2006, Keys and Roberts used this method in agricultural economics to analyze the effect of government programs on farm survival. Using 1987, 1992, and 1997 USDA *Census of Agriculture* data, they determined that the program favored larger farming operations, lowering their risk of failure and increasing survival rates (Key & Roberts, 2006). Continuing the applications of survival analysis in the realm of agricultural economics, Risch, Boland, and Crespi (2014) determined the effect of government policies on the survival of U.S. sugar beet plants from 1897 to 2011. Survival analysis can be a beneficial means of analysis and we look to contribute to this body of literature further through the use of this method.

2.5 Contribution to Literature

Van Auken and Carraher (2010) suggested that further research should be conducted to examine variables which contribute to firm success and performance, especially within value-added operations. Schenheit (2013) states that receiving a VAPG does not guarantee success, but rather can help to mitigate some risks (while not encouraging extreme risks to be taken.)

This thesis looks to evaluate the effect of receiving a VAPG on firm survival by comparing a VAPG recipient to a non-receiving peer group using the survival analysis method. The results of such a study will be able to determine the effect of the VAPG, a form of capital acquisition, on recipient's survival versus their peers' survival while also including maturity of the firm (start-up or established) and location (urban versus rural.) Descriptive statistics from this study will help to explain who has currently been receiving the grants.

Schenheit (2013) includes a variety of reasons for why there is difficulty in determining the success of the USDA's VAPG which include: (1) the grant evolving over its lifetime, (2) grants can be given out to both existing and new firms (each receiving the grants for a different focus), and (3) the characteristics of the recipients can vary greatly. Efforts in this study have been made to help address some of these challenges. A comprehensive history of the USDA VAPG, from 2001 to 2016, has been provided to help further explain the grant program and the changes that have occurred since its early beginnings. In order to address concerns regarding the two types of grants awarded, our dataset has been divided into two subsets: start-up firms and established firms. Additionally, utilizing control groups which were created by matching characteristics of VAPG recipients with characters of non-recipient peer firms, we are able to control for some of the other effects between firms. To date, none of the other studies conducted

on the VAPG have taken such approaches, limiting their ability to identify the effects of the grant program.

A study of this type can inform policy and program evaluation as it has been recognized that firm entry rates do not provide a comprehensive understanding of rural entrepreneurship. Many development strategies focusing on entrepreneurship are not solely aiming for new business development, but also striving for growth and survival (Renski H. , 2008). This study will help to shed more light on the success of the VAPG by analyzing firm performance beyond the entry stage to provide a more detailed account of whether, and how, the VAPG enhances firm survival over time and is therefore, an effective use of government dollars for rural development.

CHAPTER III

DATA AND METHODS

3.1 Data Description

The goal of this study is to analyze the effectiveness of the VAPG funding on firm success. Using data on VAPG recipients from 2001 to 2011 paired with the National Establishment Time-Series (NETS) data on all firms in Iowa and North Carolina over the time period from 1990 – 2011, we analyze the impact of the VAPG on firm survival by comparing VAPG recipients with similar firms that did not receive a VAPG. Each recipient firm is matched with non-recipient peers with similar characteristics. These peer groups represent the scenario of what would have happened to the recipient firm had the firm not received a grant. The difference in outcomes between the treatment and control groups within this study will represent the effect of the VAPG on firm survival.

3.1.1 VAPG data

This dataset was created and released for use by Dr. Michael Boland. In order to create the dataset, Dr. Boland compiled a list of USDA VAPG recipients by collecting annual press releases from the USDA Rural Business-Cooperative Service announcing the recipients. In order to gain more information, the recipients were contacted via surveys, personal interviews, and phone calls (Boland, Crespi, & Oswald, 2009). Independent producers were the most difficult group to find information on and some cases, the dataset lacks adequate information on these firms. Unfortunately, more information could not be collected about these recipients from the USDA as they are restricted by privacy laws (Schenheit, 2013). The dataset contains information

about recipients of the VAPG from 2001 to 2011. Variables contained within the dataset include: name of recipient, year grant was received, state where business resides, and grant amount awarded.

From 2001 to 2011, the VAPG program awarded $249,370,918 in grants to 1,460 unique recipients in the form of 1,706 grants[5]. The average grant size was $146,173, though grants ranged in size from $1,250 to $500,000. Below table 1 and table 2 show which states had the highest and lowest number of grants awarded, respectively.

Table 1. Top 5 states with the highest number of VAPG's, 2001 to 2011

State	Number of Grants	Average Grant Value
Iowa	144	$160,962
California	107	$190,858
Wisconsin	106	$191,858
Missouri	97	$152,027
Nebraska	94	$166,811
North Carolina (17)	32	$133,495

Table 2. Bottom 6 states with the lowest number of VAPG's, 2001 to 2011

State	Number of Grants	Average Grant Value
Nevada	2	$32,234
West Virginia	3	$66,025
Alaska	4	$56,769
Delaware	4	$149,250
Connecticut	5	$106,500
Rhode Island	5	$38,600

Viewing the recipients from a variety of angles allows us to get a better picture of the grant recipients. Figure 1, figure 2, and figure 3 show how each state plus U.S. territories compare based on the percentage of grant recipients, grants received, and grant monies awarded, respectively. Orange colored states in the following figures indicate the top five ranking states

[5] Firms are not limited to the number of grants they can receive over their lifetime; only by the fact that one (either planning or working capital) grant can be funded at one time by a USDA VAPG.

for the particular figure. The darker the shade of orange, the higher the ranking (ie: Iowa is the darkest shade of orange in figure 1 which represents the state's top ranking by percentage of total grant recipients.) All blue colored states are states which are not in the top five ranking states. North Carolina has been shaded a dark blue as it is a relevant state for this study as well, but does not fall in the top five ranking states.

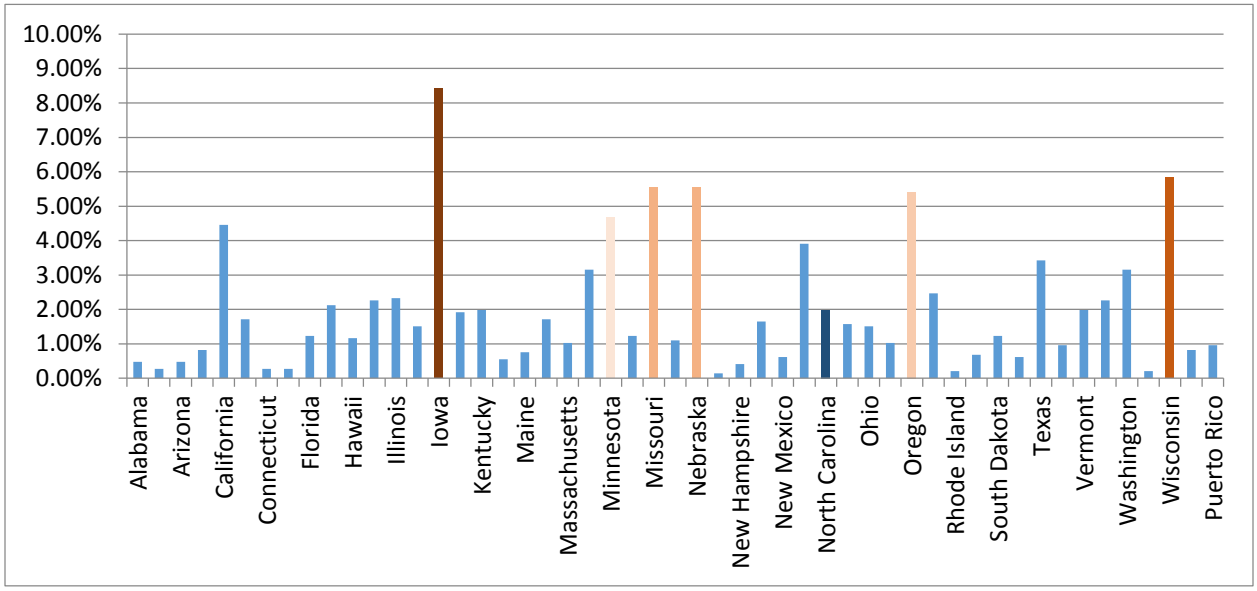

Figure 1. States by percentage of total grant recipients, 2001 to 2011

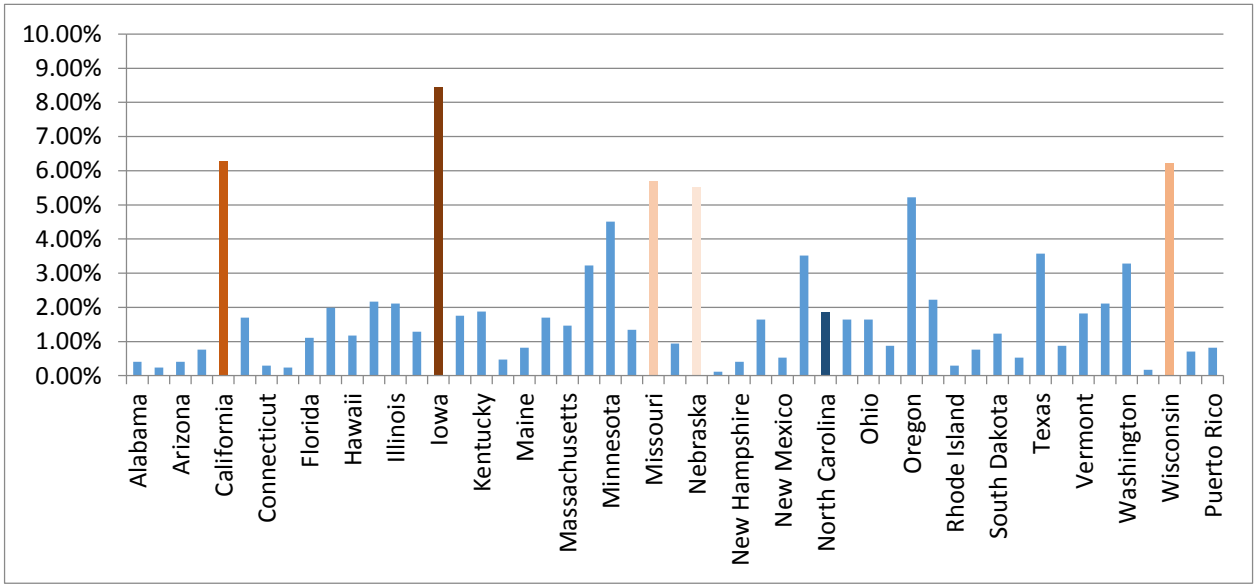

Figure 2. States by percentage of total grants received, 2001 to 2011

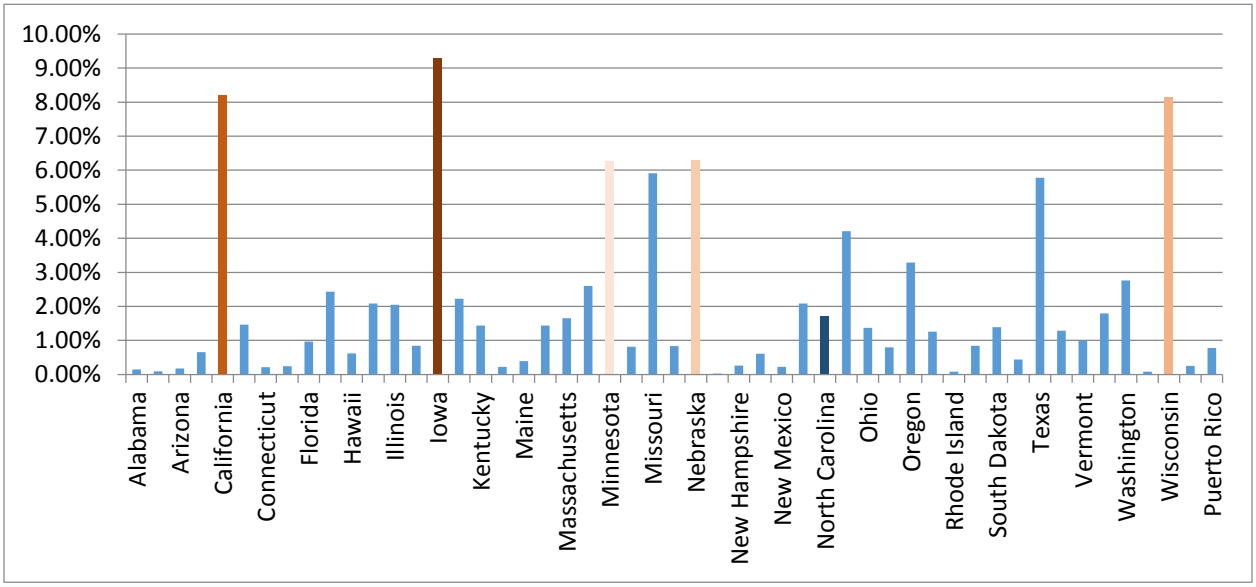

Figure 3. States by percentage of total grant monies awarded, 2001 to 2011

Iowa has the greatest number of recipients, grants, and total grant dollars awarded. Other Midwestern states with commodity based agriculture rank in the top five states for all three categories along with California and Oregon. These figures, coupled with the information from table 1 and table 2, give a very general picture of what types of firms have received the grants between 2001 and 2011. Additionally, others have reported that many recipients of the VAPG were focused on bio-based and ethanol projects, given the Presidential initiatives, and therefore, a large proportion of the recipients and grant monies were going to producer-owned cooperatives who had the ability to invest in these new, highly technical and capital intensive markets. As of 2001, roughly 16 percent of the grants were awarded to energy related projects, but by 2004, this number had increased to 21 percent (Leval, Bailey, Powell, & Tuttle, 2006).

3.1.2 NETS data

Walls & Associates utilizes Dun & Bradstreet (D&B) information on established firms to convert data from annual snapshots into a time-series database called the National Establishment Time-Series (NETS) database. This database provides longitudinal data on the U.S. economy including a variety of dynamics like job creation, survival of firms, changes in markets, historical payment and credit records, sales growth metrics, and patterns in firm movement (Walls & Associates, 2011). The dataset used in this study follows firms from January 1990 until January 2011 in the state of Iowa and North Carolina. Variables found in the dataset include, but are not limited to, name of firm, state, first year of business, last year of business, location (given by the rural-urban continuum code[6]), and industry (provided by the North American Industry Classification System[7]) (Walls & Associates, 2011).

This particular dataset has been utilized in other studies related to business and entrepreneurship. Neumark, Wall, and Zhang (2011) used NETS data in a study to determine the role of small businesses in job creation. Lee (2012) used the same dataset to study how children's exposure to different food outlets affects their health over time. Additionally, Goetz, Flemming, and Rupasingha (2012) determined the impact of self-employed individuals on the economy by incorporating the NETS data into their study. These studies, along with others who have used this dataset, have coupled it with other less descriptive datasets for greater research

[6] A system of classification, as defined by the USDA Economic Research Service (ERS), which differentiates counties by their population and adjacency to a metropolitan area. The codes range from 1 – 9, with 1 being the largest metro area and 9 being the most rural and least population regions. Further details about the rural-urban continuum codes are provided in the appendix.

[7] Used by Federal statistical agencies as the standard classification system of business establishments, the North American Industry Classification System (NAICS) uses a set of 6 digit codes to represent industries within North America. The more digits provided in the classification code, the more description is being given about the industry.

potential. Though there are places were this dataset may have flaws, it is still considered to be one of the best sources of longitudinal data when looking into firm survival (Reedy, 2011).

3.1.3 Available data

By pairing information on the VAPG recipients with the NETS data, we are able to track entry and exit of grant recipient firms and their peers from 1990 to 2011, even though the VAPG program began in 2001. Given that our NETS database is limited to Iowa and North Carolina, our finalized dataset for this study will only include VAPG recipients from these two states as well as their respective peer groups. The descriptive statistics from the VAPG data shows us that Iowa is the top grant receiving state while North Carolina falls somewhere in the middle. The two states are geographically different and have differing agricultural industries. This increases the likelihood that the results of the study will generalize to other regions of the United States.

Over the study time period, Iowa and North Carolina were facing their own changes within the local agricultural industry, which also makes them interesting states to study. With the decline of the rural economy and removal of farm subsidies, many Iowa farms were consolidated into larger farms which focused on commodity crops and large-scale, low-cost livestock production. Meanwhile in North Carolina, tobacco subsidies had been removed following the 1964 U.S. Surgeon General announcement linking smoking to lung cancer. In a similar fashion to Iowa, North Carolina's small tobacco farmers needed a new source of income pushing them to move away from their farms. Both states have begun to see new sectors within their agricultural industries appear to combat the declining rural economy. Iowa has seen a transition into value-added renewable energy and specialty crops such as grapes and vegetables. Organizations in

North Carolina have been established to help aid farmers interested in marketing value-added crops through farmer's markets, producer-owned cooperatives, and other similar outlets.

3.1.4 Data preparation

The first step in constructing the dataset for analysis was to match the VAPG recipients with the NETS database. Table 3 shows results from the matching process.

Table 3. Results from matching VAPG recipients with NETS

State	Matched Recipients	Total Recipients	Percent Matched
Iowa	101	121	83.5%
North Carolina	27	29	93.1%

We were able to match 101 of the 121 (83.5%) Iowa grant recipients and 27 of the 29 (93.1%) North Carolina grant recipients[8]. Unmatched firms are provided in the Appendix table A.2. Next, the matched recipients were researched to determine what the primary purpose of the firm was and the NAICS codes were checked to make sure they appropriately reflected this. NAICS codes provide a six-digit code that represents the industry in which the firm generally operates. Some of the firms' NAICS codes were not appropriately identified in the NETS data, and therefore, their NAICS codes were recoded to better reflect the industry in which the firm operates[9]. Firms

[8] Matching of firms between the two datasets was not a particularly easy and straight forward process as the two datasets were put together using different information sources. A few of the recipient firms matched directly however, many required more effort. Matching some firms required creative searches within the NETS dataset; for example, Central Iowa Renewable Energy LLC was spelled differently in the two datasets. Even some creative searches were unable to yield a match; for example, Iowa Choice Harvest, a frozen food manufacturer who received a 2010/2011 VAPG for planning and marketing expenses could not be located in the NETS database. In this case, given that the grant was for planning and the firm could have received a grant in 2011, it may not have been in existence January 2011, the time which the NETS dataset was compiled for 2011, and the last year available at the time of this study. It is also possible that some unmatched firms may have formed and failed between two NETS dataset "snapshots" and therefore, never been accounted for in the dataset.

[9] This is one flaw of the NETS dataset that could be corrected to some degree. For example, Picket Fence Creamery, a dairy farm and dairy product retailer, was coded as "All other specialty trade contractors." We corrected this to more appropriately reflect what the firm does or what aspect of the business the grant was used for.

which were miscoded, but could not be adequately recoded were removed[10]. Results from the NAICS recoding process are shown in table 4.

Table 4. Firms removed due to miscoded NAICS code

State	Removed Recipients	Total Recipients	Percent Removed
Iowa	5	121	4.1%
North Carolina	1	29	3.4%

For Iowa, 5 firms (4.1%) were miscoded and ultimately removed. For North Carolina, the same was true for 1 firm (3.4%.) These firms are included in Appendix table A.3.

After recoding the NAICS codes, we constructed control groups for each of the recipients. Comparison groups are a popular strategy amongst evaluators as they can help to better assess the impact of a policy or program. Such methods are used as an alternative to randomized experiments when trying to determine the effects of specific programming. Additionally, this method can isolate the effects of a particular program in order to provide better information for evaluation. Control groups allow the researcher to ask, "What would have happened if the program were not to exist?" By pairing the treatment group with a set of peers which represent the control group, the different outcomes of the two groups can be compared in order to determine the effects of the program or policy. Unlike randomly assigned treatment and control groups, the control groups in comparison group designs are selected with the expectation that they should be as similar to the treatment group as possible. Comparison group design, just like many other experimental designs, has flaws, but this method can also be very useful and

[10] A firm was removed if their NAICS code was not appropriately coded as determined by the firm name, a website, press release or from any other method of obtaining information about the firm. For example, two firms which were removed, BioMass Agri-Products, LLC and Heartland BioEnergy, operate in industries which (as of the last NAICS code revisions in 2012) do not have appropriate groups. These firms are a biorefinery for converting feedstocks to fiber-based products (many times used in landscaping) and a biorefinery with a biochar plant, respectively. Given their inappropriate NAICS codes, we chose to remove these firms and ones with similar scenarios as the control groups would ultimately not be representative peers.

help to build a simple enough story that can easily be interpreted by the audience, which typically consists of the public or policymakers (Henry, 2010).

In this particular study, our comparison groups are constructed by matching our treatment group to their control group based on a few key characteristics. This type of design is referred to as matching group design. By matching treatment and control groups, we are able to make sure the two groups are as similar as possible. Though the two groups are matched, there will still be some unobserved effects that may show up in the estimates. One way to help reduce the amount of unobserved effects between the two groups' estimates is to match the groups on as many variables as possible (Henry, 2010).

Our treatment group (VAPG recipients) are matched with peer firms from the NETS database which are located in the same state, started in the same year, and have the same NAICS code (or are operating in the same industry.) We required each control group to consist of at least three non-recipient peers[11]. In order to meet this threshold, some of the matching criteria were loosened so that we could maintain as many VAPG observations as possible. In cases where there were not at least three non-recipient peers starting in the same industry and same year, we matched at a five-digit NAICS level[12] or included firms in the same industry that began up to two years before or after the recipient firm[13]. We did not allow matching across states however. That is, all Iowa recipients are matched only with other Iowa firms and all North Carolina

[11] Most firms in the dataset were able to have control groups established by matching the state, start-up year, and NAICS code while maintaining at least three non-recipient peers. These firms were typically conducting business similar to many other firms in the state, but focusing on a niche market such as Delaware County Meats, a small scale meat processor, or Green Visions Inc., an organic farm.

[12] Yamco LLC did not have three non-recipient peers at the six-digit NAICS code level, it's control group was formed by moving to the five-digit level which increased the group to 14 non-recipient peers.

[13] For example, Golden Grain Energy's control group includes non-recipient firms from the year below their start-up year. This is due to the fact that, at least as reported in the NETS dataset, no more than two non-recipient firms in 2003 started in the recipient's NAICS code.

recipients are matched with other North Carolina firms. Due to the inability to create a control group some firms were removed[14]. Results from this process are in table 5.

Table 5. Firms removed due to lack of control group

State	Removed Recipients	Total Recipients	Percent Removed
Iowa	6	121	4.9%
North Carolina	1	29	3.4%

In Iowa, 6 (4.9%) recipients were removed while 1 (3.4%) North Carolina recipient was removed. In Appendix table A.4 removed firms are listed.

Additionally, commodity groups and agricultural associations are eligible to receive a VAPG. Given that associations can vary greatly, especially in terms of funding sources, and operate differently than a typical firm, we have removed them from this study[15]. Table 6 shows these results.

Table 6. Associations removed

State	Removed Recipients	Total Recipients	Percent Removed
Iowa	9	121	7.4%
North Carolina	5	29	17.2%

[14] Tabor Home Vineyards & Winery was removed due to the inability to establish a control group. This particular firm existed before wineries became popular in Iowa. To get at least three non-recipient peers into a control group for this firm we would have had to expand to at least three years after the firm's start-up year making them less like the recipient as the probability of failure begins to decrease around three years.

[15] Some of the associations removed are large, commodity groups within the states funded through check-off dollars such as the Iowa Corn Growers Association and Iowa Pork Producers Association. We know that the effect of the funding on firm survival is very low given that they will be funded as long as their respective commodity is produced. Additionally, some other non-commodity groups and associations were removed like Practical Farmers of Iowa, Smoky Mountain Native Plants Association, and Grow You Small Market Steering Committee as they likely do not operate like a for-profit firm.

Iowa had 9 (7.4% of recipients) associations which were removed while North Carolina had 5 (17.2% of recipients)[16]. The associations who received a VAPG have been listed in Appendix table A.5.

Lastly, in order to distinguish between the types of grants received and the timing of when firms received funding from the VAPG program, we created a variable which indicated if a recipient firm was "start-up" or "established" at the time that the grant was received. A "start-up" firm was defined as being three years or less in age while an "established" firm was considered to be older than three years of age. The two groups were separated as we are aware that survival rates for firms improve after being in business for more than three years and that capital acquisition can play a big role in this survival, most noticeably during the start-up phase. Given that the NETS data has a few flaws, there were some firms for which the maturity (start-up or established) could not be determined[17]. Results for firms removed due to this refining step are presented in table 7.

Table 7. Firms removed due to maturity error

State	Removed Recipients	Total Recipients	Percent Removed
Iowa	10	121	8.3%
North Carolina	2	29	6.9%

We removed 10 Iowa recipients (8.3%) and 2 North Carolina recipients (6.9%) due to the inability to determine if they were a start-up or established firm.

[16] This does not represent the total number of associations which received a VAPG in each state as an association could have been removed in a previous refining step. Rather these are associations which up until this point in the refining process were still eligible candidates for being included in the completed dataset.

[17] For many of the firms removed during this step of data refinement, it appears as though the firm started operation after the grant was received. This is a very plausible scenario for many of the firms (though a Data Universal Number System (DUNS) number is required for the firm before application and the NETS dataset reports based on this DUNS number) given the uses of the planning grant, but for others it makes the NETS dataset appear to have measurement error. Since we were not able to determine how long the firm had been in operation at the time of receiving a VAPG, we cannot say if they were a start-up or established firm so we removed from the completed dataset.

A brief description of the completed dataset is provided in table 8.

Table 8. Retained firms by state included in completed dataset

State	Retained Recipients	Total Recipients	Percent Retained
Iowa	71	121	58.6%
North Carolina	18	29	62.1%

The completed dataset contains 71 of the 121 (58.6%) Iowa recipient firms and 86 out of the 144 (59.7%) Iowa grants received. For North Carolina, we retained 18 of the 29 (62.1%) recipient firms and 20 out of the 32 (62.5%) grants received. Subset specific descriptions are provided in table 9.

Table 9. Subset distribution between VAPG recipients and non-recipients

Category	Start-Up Subset	Established Subset
Recipients	63	27
Non-Recipients	4,661	24,781

After dividing our completed dataset into our two smaller subsets, we have 4,661 peer firms being evaluated against 63 VAPG recipients in the start-up firm subset and 24,781 peer firms being compared to 27 VAPG recipients in the established firm subset. Table 10 and table 11 show the control groups as well as the number of treatment observations and peer observations included in each group by subset. Further details regarding the recipients kept in the analysis, their respective control groups can be found in Appendix table A.7 for start-up recipients and Appendix table A.8 for established recipients. Appendix table A.9 gives descriptions about the NAICS codes used for creating the control groups.

Table 10. Control group sizes for start-up recipients

NAICS Code	Description	Firms' Start Year	VAPG Recipients	Control Peers	Total Group Size
111339	Other non-citrus fruit farming	2010	1	6	7
111998	All other miscellaneous crop farming	2007	1	259	260
		2009	1	1,142	1,143
		2011	1	2,693	2,694
112111	Beef cattle ranching and farming	2004	1	9	10
		2009	1	5	6
112120	Dairy cattle and milk production	2006	1	8	9
		2010	1	34	35
112210	Hog and pig farming	2002	1	100	101
		2006	2	28	30
112420	Goat farming	2004	1	3	4
		2008	1	2	3
112990	All other animal production	2009	1	48	49
11511	Support activities for crop production	2005	1	14	15
115114	Post-harvest crop activities (except cotton ginning)	2000	1	4	5
22111	Electric power generation	2004	1	8	9
		2009	1	6	7
31122	Starch and vegetable fats and oil manufacturing	2001	1	4	5
		2008	1	3	4
311340	Non-chocolate confectionery manufacturing	2009	1	5	6
31151	Dairy product (except frozen) manufacturing	2003	1	4	5
		2009	1	3	4
311611	Animal (except poultry) slaughtering	2000	1	8	9
		2001	1	9	10
		2005	1	6	7
31199	All other food manufacturing	2006	1	11	12
311999	All other miscellaneous food manufacturing	2007	1	8	9
312130	Wineries	2005	1	10	11
		2006	2	7	9
		2007	1	10	11
		2008	1	7	8
		2009	1	5	6
		2011	1	5	6
325193	Ethyl alcohol manufacturing	2001	4	4	8
		2003	1	4	5
		2005	3	3	6
		2006	3	8	11
		2007 & 2008	2	5	7

Table 10. Continued

325199	All other basic organic chemical manufacturing	2007	2	11	13
325314	Fertilizer (mixing only) manufacturing	2005	1	3	4
424430	Dairy product (except dried or canned) merchant wholesalers	2005	1	4	5
		2008	1	10	11
424470	Meat and meat product merchant wholesalers	2003	1	5	6
		2010	1	10	11
424490	Other grocery and related products merchant wholesalers	2003	1	12	13
		2004	1	10	11
424520	Livestock merchant wholesalers	2005	1	31	32
424590	Other farm product raw material merchant wholesalers	2010	1	27	28
445210	Meat markets	2000	1	4	5
		2007	1	4	5
445299	All other specialty food stores	2007	1	19	20
721191	Bed-and-breakfast inns	2003	1	13	14
Total			**63**	**4,661**	**4,724**

Table 12 and 13 provide more details about the two groups, treatment and control, for the start-up subset that will be used in this study. The firm size[18], as seen in table 12, with the highest number of observations for both treatment and control is small. Small firms make up 81% and 98.9% of the treatment and control group firm sizes, respectively. These values seemed to be fairly intuitive given firms likely start with a smaller firm size and grow as they continue to develop and survive.

[18] Firm size proxies used are determined by first year employment and include: small (less than or equal to 10 employees), medium (between 11 and 50 employees), and large (greater than 50 employees.)

Table 11. Control group sizes for established recipients

NAICS Code	Description	Firms' Start Year	VAPG Recipients	Control Peers	Total Control Size
111150	Corn farming	1990	1	20,508	20,509
111331	Apple orchards	1990	1	73	74
111421	Nursery and tree production	1990	2	187	189
111998	All other miscellaneous crop farming	2001	1	192	193
112111	Beef cattle ranching and farming	2002	1	22	23
112112	Cattle feedlots	1990	1	1,003	1,004
112330	Turkey production	1990	1	43	44
112511	Finfish farming and fish hatcheries	1990	1	36	37
31151	Dairy product (except frozen) manufacturing	2007	1	4	5
311611	Animal (except poultry) slaughtering	1990 (IA)	1	185	186
		1990 (NC)	1	92	93
311612	Meat processed from carcasses	2001	1	4	5
321113	Sawmills	1990	1	48	49
424210	Drugs and druggists' sundries merchant wholesaler	1990	1	133	134
424430	Dairy product (except dried and canned) merchant wholesalers	2001	1	5	6
		2002	1	5	6
424520	Livestock merchant wholesaler	1990	1	410	411
424910	Farm supplies merchant wholesalers	1990	5	1,674	1,679
		1997	1	81	82
		1999	2	46	48
444220	Nursery, garden center, and farm supply stores	1994	1	30	31
Total			**27**	**24,781**	**24,808**

Table 12. Comparison of firm size for treatment and control groups for start-up subset

Category	Treatment		Control	
	Number	Percent	Number	Percent
Small	51	81.0%	4,612	98.9%
Medium	12	19.0%	38	0.8%
Large	0	0.0%	11	0.2%
Total	**63**		**4,661**	

Table 13 presents a breakdown of the location for the treatment and control firms within the start-up subset. For the treatment group, the largest number of firms are found in non-metro, adjacent counties while the control group has the highest proportion of firms residing in metro regions. Though, non-metro, adjacent and metro locations are the most represented locations

between the treatment and control groups, respectively, the distribution of firms throughout all three regions is relatively similar for both groups.

Table 13. Comparison of firm location for treatment and control groups for start-up subset

Category	Treatment		Control	
	Number	Percent	Number	Percent
Metro	18	28.6%	1,709	36.7%
Non-metro, Adjacent	27	42.9%	1,666	35.7%
Non-metro, Non-adjacent	18	28.6%	1,286	27.6%
Total	**63**		**4,661**	

For the established subset, similar results to table 12 are presented in table 14. Small firms again make up a large percentage of all the treatment and control firms retained within the subset, though there are more large firms present relatively to the start-up firms. Table 14 also shows that a much larger share of the established treatment group is made up of medium sized firms relative to the start-up subset.

Table 14. Comparison of firm size for treatment and control groups for established subset

Category	Treatment		Control	
	Number	Percent	Number	Percent
Small	17	63.0%	24,315	98.1%
Medium	9	33.3%	398	1.6%
Large	1	3.7%	68	0.3%
Total	**27**		**24,781**	

Table 15 shows a comparison of firm location between the treatment and control groups in the established subset. The treatment group has a larger proportion of firms in non-metro, non-adjacent regions followed closely by non-metro, adjacent. A similar distribution of firm location can be seen by the control group with the exception that the proportion of non-metro, adjacent firms exceeds that of the non-metro, non-adjacent firms. Firms in the control group are more even distributed across all three locations relative to the treatment group.

Table 15. Comparison of firm location for treatment and control groups for established subset

Category	Treatment		Control	
	Number	Percent	Number	Percent
Metro	4	14.8%	6,048	24.4%
Non-metro, Adjacent	10	37.0%	9,592	38.7%
Non-metro, Non-adjacent	13	48.1%	9,141	36.9%
Total	**27**		**24,781**	

In order to look more closely at the differences and similarities between those firms retained in the dataset and those removed, tables 16 and 17 have been included. A comparison of firm location between the retained firms and the removed firms can be seen in table 16. Of those firms who received a VAPG between 2001 and 2011, 58.7% of them were retained for this study with the largest share being found in non-metro, non-adjacent regions in Iowa and North Carolina. This is reflective of the recipient population as a whole where the highest proportion of recipients, 38.7%, are located in non-metro, adjacent locations.

Table 16. Comparison of firm location for retained firms versus removed firms as a percentage of all VAPG recipients, 2001 to 2011

	Metro (%)	Non-metro, Adjacent (%)	Non-metro, Non-adjacent (%)	Total
Retained Firms	14.7%	24.0%	20.0%	**58.7%**
Removed Firms	14.7%	14.7%	12.0%	**41.4%**
Total	**29.4%**	**38.7%**	**32%**	

Table 17 provides a comparison of average grant size between firms retained in the dataset and those removed during the data matching process. This chart shows that the average grant size received by firms removed and firms retained in the dataset are very similar. Additionally, it can be noted that these grant sizes change very little when also comparing the two states' removed and retained firms. This would suggest that the matching process did not create any bias. Had a bias been seen, for example where larger firms were more easily matched

than smaller firms, we would have expected the removed average grant size to be smaller than the average grant size for retained firms.

Table 17. Comparison of VAPG size for retained firms versus removed firms

State	Average Grant Size	
	Retained Firms	Removed Firms
Iowa	$157,393	$168,444
North Carolina	$138,333	$125,432
Total	**$153,797**	**$161,070**

In order to get a better understanding of what types of grants are received by firms in each subset, proxies were created to determine whether a firm received a planning grant or working capital grant[19]. Table 18 displays the number and percentage for each grant type received by retained recipients in each subset. The start-up firm subset appears to be made up of 57.1% working capital grants, as determined by the proxy. Though this is not necessarily what one may expect (given that the planning grants appear to be intended for this set of firms), this outcome may be due the changes made to the funding levels over the course of the grant's life. The only way to determine if this result is true, is to obtain more complete information about each of the recipients. Similarly, working capital grants also make up the largest share of grants received by established VAPG recipients.

Table 18. Comparison of grant types received for retained recipients by subset

Subset	Planning Grant		Working Capital Grant		Total
	Number	Percent	Number	Percent	Number
Start-Up	27	42.9%	36	57.1%	63
Established	10	37.0%	17	63.0%	27
Total	**37**	**41.1%**	**53**	**58.9%**	**90**

[19] Grant proxies are solely based off of the value of the first VAPG received by a firm. Those which are less than or equal to $75,000 represent a planning grant as this is the current maximum funding level while those above this value are considered to be a working capital grant. Given that the VAPG dataset does not contain complete information about the recipients, this is the best way for determining what kind of grant was received even though it is possible that a recipient of a working capital grant could have received less than $75,000. Planning grants, on the other hand, cannot exceed $75,000.

3.2 Methods

We utilized survival analysis to determine the effects of the VAPG grant on the recipients' survival relative to their peer groups. The peer groups simulate what would have likely happened to the recipient had they not received the VAPG. Separate analyses were completed for start-up recipients and established recipients as we can expect the survival rates to differ based on firm maturity.

3.2.1 Survival analysis

Using the survival analysis method, we are looking to determine the difference in survival rates of VAPG recipients versus their peer groups in order to evaluate the grant's role in firm success. By utilizing this type of comparison group design, we are able to simulate the probable outcome, in terms of survival, for the recipient firm had they not received a VAPG. A high level illustration for the model can be seen in figure 4.

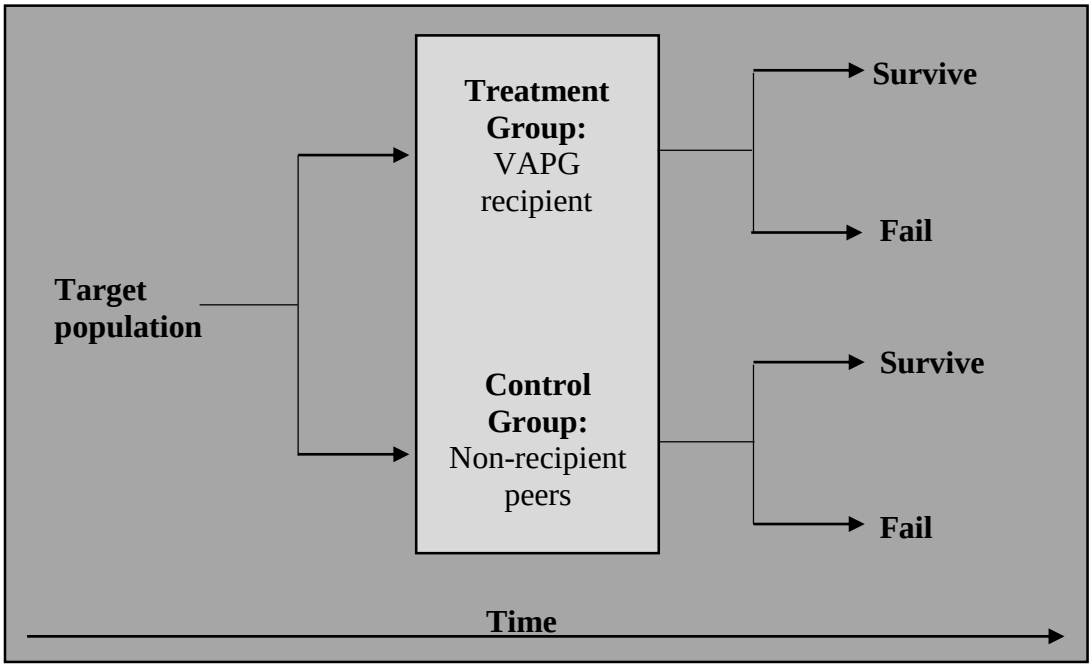

Figure 4. Illustration of survival analysis

Basic survival model

Each firm has a survival duration, *T*, which represents the length of time a firm stayed in business. The probability of a firm exiting the market (or not surviving) conditional on the firm having been in business until time *t*, a specific value of *T*, is:

$$\Pr(t < T \leq t + \Delta t | T > t).$$

The hazard function is therefore represented as:

$$h(t) = \lim_{\Delta t \to 0} \frac{\Pr(t<T\leq t+\Delta t|T>t)}{\Delta t} = \frac{f(t)}{S(t)}.$$

where $f(t)$ represents the density function[20]. This hazard function provides the rate at which a firm exits per unit of time *t*, which for this study is years. We assume a log-logistic distribution for the survival model. This matches what other empirical studies have suggested about firm survival[21] which is initially increasing until a particular time (for new firms around three years) and then decreasing.

In this study, a firm, i¸ survives over a particular amount of time, *T*. This time varies based on explanatory variables, x_i, observed at the beginning of the survival duration. The survival for firm *i* is then as follows:

$$S(t_i, \beta, \gamma) = \frac{1}{1 + (\lambda_i t_i)^{1/\gamma}}$$

where $\lambda_i = \exp(-x_i\beta)$, β represents parameter estimates, and γ is a necessary scale parameter estimated from the data which affects the shape of the survival and hazard functions[22]. This

[20] The density function is defined as: $f(t) = \frac{dF(t)}{dt}$.

[21] Such studies include Jovanovic (1982), Geroski (1995), Caves (1998), and Audretsch, Santarelli, and Vivarelli (1999).

[22] If $\gamma > 1$, the hazard rate is monotonic, but if $0 < \gamma < 1$, the hazard rate will start out increasing and then begin to decrease over time.

function is non-increasing. At the beginning, $t = 0$, the probability of surviving past the initial time period is 1. As time approaches infinity, the survival curve also approaches infinity. The coinciding density function of the survival duration T is as follows:

$$f(t_i, \beta, \gamma) = \frac{\lambda^{1/\gamma} t^{1/\gamma - 1}}{\gamma\left\{1+(\lambda t)^{1/\gamma}\right\}^2}.$$

By increasing one explanatory variable, x_{ij}, and similarly raising the corresponding β_j while holding all other variables constant, a decline in the failure rate will be observed along with an increase in the probability of firm survival. Alternatively, if the β_j decreases, an increase in the hazard rate and decrease in the probability of survival will be observed.

If the scale parameter, γ, is between zero and one, then our hazard rate becomes:

$$h(t_i, \beta, \gamma) = \frac{t_i^{1/\gamma - 1} \lambda_i^{1/\gamma}}{\gamma\left\{1+(t_i\lambda_i)^{1/\gamma}\right\}}.$$

The log likelihood estimation is then:

$$L(\beta, \gamma | x_i) = \sum_{i=1}^{n} d_i \ln f(t_i, \beta, \gamma) + \sum_{i=1}^{n} (1 - d_i) \ln S(t_i, \beta, \gamma)$$

where d_i represents a dummy variable determining if the firm exits.

Adding unobserved heterogeneity

Thus far, our model has assumed that the survival of firms only differs based on the characteristics, x_{ij}, and allows for no difference in the amount of risk a particular firm faces. In this model, we have added frailty, α, to allow heterogeneity within the survival of the observations due to differing risks faced by individual firms. This means that the individual firms are subject to hazard rates that vary from the average hazard rate of the population. This is a

compelling feature to add to the survival analysis model as it helps to simulate that firms are independent of one another in how they choose to learn about their product, market, resources, etc. or how to become more efficient producers (Jovanovic, 1982). This feature is added to the previous functions as follows:

$$\text{Hazard function: } h(t_i, \beta, \gamma|\alpha) = \alpha \bullet h(t_i, \beta, \gamma)$$

$$\text{Survival function: } S(t_i, \beta, \gamma|\alpha) = \{S(t_i, \beta, \gamma)\}^{\alpha}$$

where α has a mean of one and variance of θ.

Given that we cannot observe α, it must be incorporated into the survival function. The probability density function for α is represented as *g(α)*. We use this function to further depict the relative risk for failure that a firm has. If α > 1, the firms experience more risk uncorrelated with their characteristics, x_{ij}[23]. This increased risk is then assumed to follow them through their survival. Those firms with α < 1, experience less risk and have consistently lower levels of risk throughout the firm's life (Gutierrez, 2002). This again, follows along with the trends of firm survival as found in previous economic studies.

The Inverse-Gaussian distribution[24] was chosen to represent the probability density function, *g(α)*. This distribution is known for allowing the firms to become more homogeneous over time relative to other possible distributions[25] (Hougaard, 1986). We can incorporate the probability density function into our survival function:

$$S_\theta(t_i, \beta, \gamma, \theta) = \int_0^\infty S(t_i|\alpha)\, g(\alpha) d\alpha = \; exp\left\{\frac{1}{\theta}\left(1 - \sqrt{1 - 2\theta ln[S(t_i)]}\right)\right\}.$$

[23] This increased risk could be a result of inclement weather, poor management, bad luck, lacking technology and other unobserved factors.
[24] Distribution has a mean equal to one and variance equal to θ. With $\theta \neq 0$, the unobserved risk of failure between firms differs.
[25] Riskier firms fail sooner after starting and therefore, firm risk will become more homogenous over time as the successful firms have lower and more similar risks (Vaupel, Manton, and Stallard, 1979).

The new log likelihood estimation becomes:

$$L(\beta, \gamma, \theta | x_i) = \sum_{i=1}^{n} d_i \ln f_\theta(t_i, \beta, \gamma, \theta) + \sum_{i=1}^{n} (1 - d_i) \ln S_\theta(t_i, \beta, \gamma, \theta)$$

where $f_\theta(t_i, \beta, \gamma, \theta)$ is the new probability density function.

Survival analysis models

In this study, we have estimated six different survival analysis models on each of our subsets, start-up firm and established firm. These models incorporate the set of variables summarized in table 19. Our tests of survival began with our most basic model which estimated the survival function with the following variables included: VAPG, VALUE_sc, SIZE_M, SIZE_L, NMA, NMNA. Model (1) compares the likelihood of firm survival based on having received a grant, the grant size (in $100,000 increments), firm size, and firm location. The second model compares the likelihood of survival in the same manner as (1) with the exception that we are looking at the effects from the total value (in $100,000 increments) of all VAPG's received by a firm. Model (3) has added interaction variables between location and being a grant recipient in order to conclude if location changes a recipient's likelihood of survival. Next in model (4), we have added to our basic model, an interaction variable between being a grant recipient and state to evaluate if a firm's state of operation changes their survival function. The next two models, focus on aspects related to the amount of money received from the grant. In model (5), we utilize the MULTI variable to determine the impact of receiving multiple VAPG's on a firm's survival. Using the maximum amount for a 2016 planning grant, we have created VALUE_2016pg to measure the effects of the two grant types available through the VAPG program on survival in model (6).

Table 19. Variables used in survival analysis models

Variable Name	Representation	How determined	Start-up Firm Subset		Established Firm Subset	
			Mean	Standard Deviation	Mean	Standard Deviation
VAPG	Grant recipients	0 if a non-recipient, 1 if a recipient	0.013	0.115	0.001	0.033
SIZE_S	Small firms	First year employment ≤10	0.987	0.113	0.981	0.137
SIZE_M	Medium firms	First year employment >10 and ≤50	0.011	0.102	0.016	0.127
SIZE_L	Large firms	First year employment >50	0.002	0.048	0.003	0.053
Metro	Metropolitan location	Rural-Urban Continuum Code is 1, 2 or 3	0.363	0.481	0.242	0.428
NMA	Non-metropolitan location but adjacent to one	Rural-Urban Continuum Code is 4, 6 or 8	0.358	0.479	0.387	0.487
NMNA	Non-metropolitan location and non-adjacent to one	Rural-Urban Continuum Code is 5, 7 or 9	0.276	0.447	0.369	0.483
VAPG_Metro	Interaction between Metro and VAPG	VAPG x Metro	0.004	0.062	0.000	0.013
VAPG_NMA	Interaction between NMA and VAPG	VAPG x NMA	0.006	0.075	0.000	0.019
VAPG_NMNA	Interaction between NMNA and VAPG	VAPG x NMNA	0.004	0.062	0.000	0.023
VAPG_IA	Interaction between state of operation (IA) and VAPG	VAPG x IA	0.011	0.105	0.000	0.028
VAPG_NC	Interaction between state of operation (NC) and VAPG	VAPG x NC	0.002	0.046	0.000	0.018
MULTI	Recipient of multiple VAPG's	0 if received ≤ 1 VAPG, 1 if received > 1 VAPG	0.003	0.052	0.000	0.006
VALUE_sc	Value of first VAPG received scaled by $100,000	Value of first grant scaled by $100,000	0.020	0.243	0.002	0.69
TOTVALUE_sc	Total value of all VAPG's received scaled by $100,000	Sum of VAPG's received scaled by $100,000	0.25	0.296	0.002	0.070
VALUE_2016pg	Grants receiving ≤ $75,000	1 if VALUE ≤ $75,000, 0 otherwise	0.006	0.075	0.000	0.020

Time ratios

Given that the dependent variable of the survival function is computed as the log of the length of survival, the generic form of our model is:

$$\ln(S) = \beta_i x_i + \varepsilon$$

where the marginal effect of x_i is found by:

$$\frac{dln(S)}{dS} = \beta_i.$$

Therefore, a one unit increase in x_i increases the log survival time by β_i or the survival time increases by $\beta_i \; x \; 100$ percent. Neither of these interpretations are particularly natural to think about. Due to this, we have chosen to report our results in the form of time ratios which are more intuitive. Our generic model can also be expressed as:

$$S = e^{\beta_i x_i} e^{\varepsilon}.$$

If we increase x_i by one unit, then the ratio of survival times between the generic model and the changed model becomes:

$$\frac{S(x_i+1)}{S(x_i)} = e^{[x_i-(x_i+1)]\beta_i} = e^{\beta_i}.$$

where e^{β_i} is the time ratio. A one unit increase in x_i, using the time ratio, can now be interpreted as increasing the survival time by e^{β_i} times. Therefore, if e^{β_i} = 2.03, then a one unit increase in x_i would increase the survival time by 2.03 times. Values for e^{β_i} greater than one have a positive effect on the survival time while those less than one have a negative effect.

CHAPTER IV

RESULTS

4.1 Survival Analysis

4.1.1 Test for randomness

We first wanted to check if selection of VAPG recipients was approximately random in our dataset once the matching of recipients with their controls groups was completed or if there were certain characteristics which made the recipients more likely to receive a grant relative to their peer group. In order to test this, we estimated three probability models to predict the probability that a firm would receive a VAPG. Each of these three models were run on both the start-up and established firm subsets separately. The probability estimation model fits a maximum likelihood model in which there are only two possible outcomes. For our particular model, a firm can either receive a VAPG or not receive a VAPG.

We used VAPG, a binary variable, to represent receiving a VAPG. If VAPG is equal to one, the firm was a grant recipient. Alternatively, zero represents a non-recipient. The general probability estimation model is as follows:

$$VAPG_i^* = \alpha + \beta x_i + \varepsilon$$

where

$$VAPG_i = \begin{cases} 1 & if\ VAPG_i^* > 0 \\ 0 & otherwise \end{cases}$$

Variables included were in this model include the size (SIZE_S, SIZE_M, and SIZE_L), location (Metro, NMA, and NMNA) and a state (IA) variable to indicate where the firm is located.

Variables SIZE_L and Metro were omitted when running the models and therefore represent the base case. The first probability estimation model included all of the firms in the subset and included a dummy variable IA, to allow the probability of receiving a grant to vary by state. Next, the two states were separated and new models where run for each state using the same variables as the previous model (with the exception of the state variable.) Model (2) estimated the probability for Iowa firms only while model (3) was for only North Carolina firms. All three models have been clustered on the control groups to limit the effects related to the differing control groups sizes[26]. Results for the three models are provided by subset in table 20.

Table 20. Results of probability estimation models by subset

Variables	Start-Up Firm Subset			Established Firm Subset		
	(1) – All Firms	(2) – IA Firms	(3) – NC Firms	(1) – All Firms	(2) – IA Firms	(3) – NC Firms
SIZE_S	2.60	2.73	-1.17	-0.79	-1.42	3.67
	(10.12)	(10.73)	(-2.52)	(-1.67)	(-4.40)	(21.87)
SIZE_M	4.05	4.25	(omitted)	0.29	-0.12	3.95
	(17.97)	(17.51)		(0.62)	(-0.42)	(13.14)
NMA	0.17	0.13	0.60	0.29	0.04	0.58
	(1.33)	(0.96)	(1.63)	(1.10)	(0.14)	(1.51)
NMNA	0.14	0.13	-0.13	0.55	0.47	(omitted)
	(1.10)	(1.02)	(-0.24)	(2.16)	(1.79)	
IA	-1.03			-1.07		
	(-4.23)			(-4.02)		
constant	-4.01	-5.16	-0.32	-1.79	-2.16	-6.05
	(-14.32)	(-47.07)	(-0.78)	(-3.62)	(-6.95)	(-17.55)

The results of our probability estimation models suggest that recipients of VAPG are approximately randomly selected in our dataset. For the start-up subset, the results show that for all three models that the location of the firm plays very little role in being selected as a recipient. We see that the size of the firm does have a slight impact on the probability of receiving a

[26] Other models were run which included no control for size of the control groups as well as weighting based on control group size. Clustering the models was determined to be the best form of the models.

VAPG. Small and medium sized firms are more likely than large firms to be grant recipients. These results are reasonable given that start-ups are more likely to have fewer than 50 employees, the threshold level for a large firm in this study. For the established subset, location once again has very little effect on the probability of receiving a grant. In Iowa smaller firms are less likely to receive a grant, while Model (3) suggests that in North Carolina, being a smaller firm relative to a large firm increases the odds of a receiving a grant, although there is little different between being small or medium sized.

4.1.2 Clustering

Efforts were made to cluster the models by the control groups to help eliminate effects due to differing control group sizes. This method proved to not work as our models were lacking a chi squared estimate for goodness of fit. Therefore, we opted to not cluster our models as the results for the variables were very similar to the clustered models and there were no changes in levels of significance.

4.1.3 Model specific results

In general, receiving a VAPG improved the likelihood of survival for firms in both subsets. The established firm subset produced results which are less clear for interpreting the grant's effect on survival. Established firms which received the grant are most likely using the VAPG to develop a new project or spin-off from current operations rather than to purely support the primary business, given the restrictions placed in the grant application for this population of applicants. Therefore, the relationship between the VAPG and survival is less clear for these established firms. The start-up firm subset, on the other hand, has a more direct interpretation of

the results. The VAPG can be seen as a form of capital acquisition for which other studies have found to be a critical component of firm survival.

Start-up firm subset results

Receiving a VAPG has a positive and significant (or very close to significant) impact on firm survival as shown in the results of the six models tested on our start-up firm subset. Other firm characteristics included in the models have no significant impact on survival in any of the models, unless interacted with having received a grant. The size and location variables also have very similar effects on firm survival across all six models. Results for the six models tested on the start-up firm subset are presented in table 21. This suggests that, conditional on year of entry, state and industry, firm size and rural/urban location do not significantly increase or decrease survival time.

In model (1), relative to a small, metro, non-recipient firm, a VAPG recipient firm's survival time is increased 1.88 times. Conditional on having received a grant, the value of the first grant received (in $100,000 increments) has a positive, but insignificant impact on overall survival. Model (2) shows that receiving a grant itself is not significant to firm survival (though very close), but when joined with the value of the total value of all grants received, the effect on survival of having received a grant is significant. Results from the third model show that recipients in non-metro, non-adjacent (also considered rural) regions see the largest increase in firm survival from receiving a grant followed by metro and non-metro, adjacent firms. Model (3) also shows that across all locations, the value of the first grant received does have a significantly different effect on firm survival. Model (4) shows that, conditional on receiving a VAPG, there is not a significantly different impact by state on firm survival.

Models (5) and (6) begin to tell us more about how much funding is received by a firm through the VAPG program. Having received multiple VAPG's, as shown in model (5), has no additional impact on firm survival relative to a one-time VAPG recipient. Conditional on having received multiple VAPG's, the total value of all grants received (in $100,000 increments) increases firm survival. Model (6) produces results which show that, conditional on having received a VAPG, receiving a VAPG less than or equal to $75,000 (a proxy for a planning grant) does not have a significant effect on survival relative to similar firm who received a VAPG of greater than $75,000 (a proxy for a working capital grant).

Established firm subset results

The same six models tested on the start-up firm subset were initially tested on the established firm subset as well. Errors occurred in the models once removing the clustering of our data that caused the standard errors of specific variables to be very small or missing and therefore, not providing confidence intervals. A correlation matrix was plotted for the models with errors in the results and it was determined that the variables in question were highly correlated with another variable included in the respective model. Therefore, models (1), (2), and (6) were the three models successfully tested on the established firm subset. Results for these models can be found in table 22.

Much like the start-up firm subset, receiving a VAPG significantly increased firm survival time in the three models tested on the established subset. The results from each model indicates being a medium sized firm had significant impact on firm survival though the other firm sizes did not. The effect of being a medium sized firm, along with the other firm characteristic variables, produced results that are consistent across the different model forms.

Table 21. Results of start-up firm subset survival models

Variable	(1)	(2)	(3)	(4)	(5)	(6)
VAPG	1.88*	1.60	1.99	2.31*	1.68	3.25**
	(2.25)	(1.64)	(1.47)	(2.39)	(1.76)	(2.61)
VALUE_sc	1.03		1.02	0.99		0.90
	(0.35)		(0.18)	(-0.12)		(-0.81)
SIZE_M	1.29	1.28	1.26	1.30	1.29	1.30
	(1.28)	(1.26)	(1.16)	(1.31)	(1.33)	(1.39)
SIZE_L	1.02	1.03	1.01	1.02	1.01	1.02
	(0.06)	(0.10)	(0.05)	(0.06)	(0.03)	(0.08)
NMA	1.03	1.03	1.03	1.03	1.03	1.03
	(0.51)	(0.53)	(0.53)	(0.46)	(0.52)	(0.50)
NMNA	0.98	0.98	0.98	0.98	0.98	0.97
	(-0.39)	(-0.40)	(-0.42)	(-0.40)	(-0.37)	(-0.43)
TOTVALUE_sc		1.10			1.03	
		(1.07)			(0.26)	
VAPG_NMA			0.91			
			(-0.20)			
VAPG_NMNA			1.05			
			(0.11)			
VAPG_NC				0.34		
				(-1.41)		
MULTI					1.83	
					(1.12)	
VALUE_2016pg						0.37
						(-1.74)
constant	3.14**	3.12**	3.12**	3.21**	3.17***	3.05**
	(2.93)	(2.90)	(2.90)	(2.96)	(2.94)	(2.78)
gamma	0.17***	0.17***	0.17***	0.17***	0.17***	0.17***
theta	31.16***	30.76***	31.27***	31.32***	29.56***	30.20***
N	4724	4724	4724	4724	4724	4724
Log likelihood	-696.05	-695.55	-695.99	-695.06	-694.86	-694.40
chi2	104.51	105.52	104.64	106.50	106.90	107.81

Joint tests of significance

(1) VAPG + VALUE_sc
1.94*** (3.09)

(2) VAPG + TOTVALUE_sc
1.76** (2.55)

(3) VAPG + VAPG_NMA
1.82* (2.00)

VAPG + VALUE_sc + VAPG_NMA
1.86** (2.38)

VAPG + VAPG_NMNA
2.09* (1.72)

VAPG + VALUE_sc + VAPG_NMNA
2.14* (2.05)

(4) VAPG + VAPG_NC
0.79 (-0.37)

VAPG + VALUE_sc + VAPG_NC
0.78 (-0.37)

(5) VAPG + MULTI
3.08* (1.68)

VAPG + TOTVALUE_sc + MULTI
3.17* (1.97)

(6) VAPG + VALUE_2016pg
1.19 (0.43)

VAPG + VALUE_sc + VALUE_2016pg
1.07 (0.17)

Note: Time ratios are provided. Z-scores are reported in parentheses. * = p < 0.05; ** = p < 0.01; *** = p < 0.001

Results from model (1) suggest that receiving a VAPG increased survival by 6.65 times relative to a small, metro, non-recipient firm. This result is consistent with the model (1) results of the start-up subset, though the time ratio is much larger. Due to the difference in time ratio results, the interpretation of how the VAPG effects a firm's survival for a start-up firm versus an established firm may need to be evaluated further given that these firms are older and more well-established within the market and their use of the grant is different. The model also shows that, conditional on having received a VAPG, increasing the value of the first grant does not significantly increase firm survival.

Model (2) presents results very similar to model (1), but for the total value of all VAPG monies received. Model (6)'s results show that, conditional on being a VAPG recipient, both grant sizes are significant, but the effect on survival is larger for grants greater than $75,000 (11.55 times) relative to those less than or equal to $75,000 (5.34 times). The value of the first grant received in this model does not significantly impact firm survival.

4.1.4 Survivor probability estimates

To compare and learn more about the differences in survival probabilities between the treatment and control groups, we used model (1) to predict the survival probabilities for the treatment and control group in each subset. To learn more about the effect of the value on survival, we divided the treatment group up into three categories based on the value of the first VAPG received. The cut-off values were determined by looking at the quartiles of the value distribution between all recipients. Additionally, to test the effects of frailty on the survival probability, we also conducted two forms of the survival probability estimation, one which had

heterogeneous risk and one which did not. Results for the survival probability estimation test are listed in table 23.

Table 22. Results of established firm subset survival models

Variable	(1)	(2)	(6)
VAPG	6.65**	6.52**	11.55*
	(2.88)	(2.79)	(2.10)
VALUE_sc	0.86		0.73
	(-0.56)		(-0.83)
SIZE_M	1.67***	1.67***	1.67***
	(7.25)	(7.25)	(7.24)
SIZE_L	1.00	1.00	1.00
	(0.00)	(0.00)	(0.01)
NMA	1.02	1.02	1.02
	(0.87)	(0.87)	(0.87)
NMNA	0.97	0.97	0.97
	(-1.62)	(-1.62)	(-1.62)
TOTVALUE_sc		0.87	
		(-0.50)	
VALUE_2016pg			0.46
			(-0.62)
constant	14.56***	14.55***	14.54***
	(11.27)	(11.27)	(11.26)
gamma	0.59***	0.59***	0.59
theta	0.69*	0.69*	0.69
N	24,808	24,808	24,808
Log likelihood	-27370.50	-27370.53	-27370.29
chi2	1053.60	1053.54	1054.01

Joint tests of significance

(1)	VAPG + VALUE_sc	
	5.73***	(3.71)
(2)	VAPG + TOTVALUE_sc	
	5.69***	(3.65)
(6)	VAPG + VALUE_2016pg	
	5.34**	(2.46)
	VAPG + VALUE_sc + VALUE_2016pg	
	3.91*	(1.92)

Note: Time ratios are provided. Z-scores are reported in parentheses.
* = p < 0.05; ** = p < 0.01; *** = p < 0.001

Table 23. Survivor probability estimation results by subset and frailty condition

Start-Up Subset Survival Probability Prediction Results					
Unobserved Frailty					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	4,661	0.950	0.094	0.478	1.000
Recipient, Value ≤ $35,000	16	0.933	0.690	0.815	1.000
Recipient, Value > $35,000 and ≤ $250,000	32	0.898	0.123	0.595	1.000
Recipient, Value > $250,000	15	0.839	0.128	0.580	1.000
Conditional Frailty Equal to 1					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	4,661	0.877	0.242	0.000	1.000
Recipient, Value ≤ $35,000	16	0.820	0.214	0.426	1.000
Recipient, Value > $35,000 and ≤ $250,000	32	0.731	0.345	0.009	1.000
Recipient, Value > $250,000	15	0.551	0.365	0.006	1.000
Established Subset Survival Probability Prediction Results					
Unobserved Frailty					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	24,781	0.636	0.162	0.282	0.991
Recipient, Value ≤ $35,000	7	0.937	0.028	0.915	0.984
Recipient, Value > $35,000 and ≤ $250,000	20	0.885	0.060	0.777	0.975
Recipient, Value > $250,000	7	0.855	0.067	0.777	0.945
Conditional Frailty Equal to 1					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	24,781	0.587	0.190	0.162	0.991
Recipient, Value ≤ $35,000	7	0.935	0.029	0.913	0.984
Recipient, Value > $35,000 and ≤ $250,000	13	0.897	0.057	0.762	0.974
Recipient, Value > $250,000	7	0.847	0.073	0.760	0.944

Our results show that generally, across all four estimations, the VAPG recipients who received larger valued grants had a lower survival probability relative to those recipients of lesser valued grants. Though we cannot conclude the reason for this, we believe this to be a probable result given that (unlike our survival analysis regression models) there are no controls for industry. Therefore, certain industries are known to receive a greater proportion of the higher valued grants, such as ethyl alcohol manufacturing, yet the survival of these firms is also not nearly as high given that they are riskier enterprises. Because these probabilities are averaged

over all industries in the dataset, the riskier and higher valued VAPG recipients could be bringing down the estimated survivor probability for all firms receiving higher valued grants. We also present two estimations for each subset based on different frailty assumptions. Result for both probability estimations (for each subset) suggest that different outcomes for survival probability exist given what risk is assumed.

4.1.5 Survival time estimates

Given that the previous results for the start-up subset challenge the findings from the survival analysis, we estimated the median survival times to better illustrate the effects of the grant on firm survival. Similar to the survival probability estimation tests, we were interested in determining the predicted median survival time for firms who had received a VAPG and those who did not. Estimations for the median survival time were run for the treatment group by VAPG value levels and for the control group. Our results, as presented in table 24, show that the group who survives the longest in all estimations is medium sized grant recipients followed by small grant recipients. Those firms receiving a large grant had the shortest median survival time estimates for recipients of a VAPG, but this estimated survival time is still significantly larger than the estimated survival time for non-recipients. These results, therefore, support the general result of our survival analysis models which suggest that receiving a VAPG increases firm survival.

Table 24. Median survival time estimation results by subset and frailty condition

Start-Up Subset Median Survival Time Prediction Results					
Unobserved Frailty					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	4,661	125.320	97.594	4.506	1,162.537
Recipient, Value ≤ $35,000	16	122.535	198.580	20.609	590.282
Recipient, Value > $35,000 and ≤ $250,000	32	261.146	504.302	8.672	2123.870
Recipient, Value > $250,000	15	109.897	304.346	18.255	1209.604
Conditional Frailty Equal to 1					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	4,661	31.080	24.203	1.117	288.310
Recipient, Value ≤ $35,000	16	30.389	49.248	5.111	146.390
Recipient, Value > $35,000 and ≤ $250,000	32	64.764	125.067	2.151	526.721
Recipient, Value > $250,000	15	27.255	75.478	4.527	299.982
Established Subset Median Survival Time Prediction Results					
Unobserved Frailty					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	24,781	23.422	4.984	4.438	63.753
Recipient, Value ≤ $35,000	7	88.723	38.493	29.076	146.883
Recipient, Value > $35,000 and ≤ $250,000	13	99.863	47.376	26.073	223.168
Recipient, Value > $250,000	7	64.320	22.429	34.894	107.031
Conditional Frailty Equal to 1					
Case	**Observations**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Non-recipient	24,781	19.570	4.165	3.708	53.267
Recipient, Value ≤ $35,000	7	74.130	32.162	24.294	122.723
Recipient, Value > $35,000 and ≤ $250,000	13	83.437	39.583	21.784	186.461
Recipient, Value > $250,000	7	53.741	18.740	29.155	89.427

4.1.6 Survival estimate scenarios

Given that the previous two tests have been averaging the estimated probabilities and time values over different industries with varying degrees of risk and for firms starting at different times, we set up scenarios to estimate the impact of the grant while holding all other characteristics constant. This helps to isolated the impact of receiving the grant. Scenarios were created for a mock firm to learn more about the median survival time estimations and to compare estimates between the two subsets. These estimations include a specific firm size, location,

industry, and start year (matching the start year as closely as possible between the subsets.) Table 25 presents predicted median survival times by subset for each of four scenarios. Each scenario produces results like the previous test: median survival time for the treatment (divided into funding level categories) and the control, but it holds constant firm size, location, industry and year of entry to better isolate the effect of the grant on firm survival. Funding levels were simulated by setting the VAPG value for each group at the respective level of $25,000, $100,000, and $350,000.

Our first scenario estimates the median survival time for a small, rural firm involved in beef cattle ranching or farming that started in 2004, for our start-up subset, and 2002, for our established subset. The second scenario tested was for a small, non-metro, non-adjacent firm in the dairy product wholesaling industry who began operating in 2005, for the start-up subset, or in 2002, for the established subset. The results from both scenarios show that for both subsets, being a grant recipient increases median survival times. Generally, the start-up subset results present survival time estimates that increase as the value of the grant increases while the established subset presents declining estimates as the VAPG value increases. Though this is the case, by looking at the standard errors and confidence intervals for the three VAPG groups, it can be seen that the recipient of a $100,000 VAPG has a relatively small standard deviation in relation to the other two groups and tighter confidence interval.

Table 25. Survival time estimation results by scenario and subset

Median Survival Time Scenario Results							
Scenario		**Margin**	**Std. Err.**	**Z Score**	**P Value**	**Confidence Interval**	
Base - Firm Size: Small, Location: NMNA, Industry: 112111, Start Year: 2004							
Start-Up	Non-recipient	15.272	6.133	2.490	0.013	3.252	27.292
	Recipient, Value = $25,000	28.958	13.930	2.080	0.038	1.658	56.258
	Recipient, Value = $100,000	29.670	13.575	2.190	0.029	3.063	56.276
	Recipient, Value = $350,000	32.170	14.707	2.190	0.029	3.344	60.996
Base - Firm Size: Small, Location: NMNA, Industry: 112111, Start Year: 2002							
Established	Non-recipient	7.720	2.210	3.490	0.000	3.387	12.052
	Recipient, Value = $25,000	49.458	32.688	1.510	0.130	-14.609	113.525
	Recipient, Value = $100,000	44.232	23.982	1.840	0.065	-2.771	91.236
	Recipient, Value = $350,000	30.484	18.859	1.620	0.106	-6.479	67.446
Base - Firm Size: Small, Location: NMA, Industry: 424430, Start Year: 2005							
Start-Up	Non-recipient	28.733	12.578	2.280	0.022	4.082	53.385
	Recipient, Value = $25,000	54.483	27.637	1.970	0.049	0.316	108.650
	Recipient, Value = $100,000	55.821	27.136	2.060	0.040	2.636	109.006
	Recipient, Value = $350,000	60.525	29.613	2.040	0.041	2.484	118.566
Base - Firm Size: Small, Location: NMA, Industry: 424430, Start Year: 2002							
Established	Non-recipient	5.222	2.270	2.300	0.021	0.772	9.672
	Recipient, Value = $25,000	33.458	24.375	1.370	0.170	-14.316	81.233
	Recipient, Value = $100,000	29.923	18.606	1.610	0.108	-6.543	66.389
	Recipient, Value = $350,000	20.622	14.155	1.460	0.145	-7.122	48.366

CHAPTER V

SUMMARY AND CONCLUSIONS

5.1 Results Summary

Our results show that receiving a VAPG has a positive and significant effect on firm survival for both start-up and established firms, though the interpretation between the two groups' results may be different. This suggests that firms receiving a grant are more likely to be successful in terms of increased survival length. The results of the six models tested on the start-up firm subset imply that receiving a grant and the location of the recipient can have an effect on firm survival though the firm's state does not. The effects related to the value of the grant(s) received are positive, but results are less precise in determining the true effect on survival. We understand that the USDA is looking to support firms with the highest probability of success. Given this, our study finds that VAPG recipient firms do indeed survive longer than their non-recipient peers while controlling for a variety of characteristics including start year, state, and industry. This therefore, provides results that the program has a positive impact on firm survival.

Smaller grants recipients did not survive significantly longer than their non-recipient peers. Though this may seem like smaller grants do not improve survival, one explanation for these results could be largely based on the types of projects funded by the two different grant types. For example, planning grants, which by the *Federal Register* ruling have a smaller maximum funding limit, can be used for the development and implementation of feasibility studies, business plans, and marketing plans suggesting that the recipients are in the early stages of business development. Receiving funding for a feasibility study which proves that the business would not be feasible may seem like a failure (and contribute to the insignificance of

smaller grants), yet in reality, the grant funding was successful if it prevented a business which had a low probability of success from even entering the market.

Another argument for the difference in effects between grant sizes is that working capital grants, like planning grants, can be used for a particular set of projects. Given that a working capital grant has a higher maximum funding limit, and the USDA is looking to select successful VAPG recipients, the estimated effects of the grant on firm survival may be biased upward favoring those who have proven their viability in the market. In recent years, the requirements for receiving a working capital grant have been extended to include that at a minimum a solid feasibility study must have been conducted prior to applying for a working capital grant to prove firm stability. With requirements like this, it can be seen how the recipient selection process may be altering the true effects of the grant funding on survival. For these firms, we then need to ask if the firm would have continued to be as successful without the VAPG grant.

Similar to the start-up firm subset, the established firm subset's models suggested that receiving a grant had a positive and significant impact on firm survival and with much higher time ratios reported. These large time ratios may have a different interpretation from the effect seen on start-up firm survival from receiving a grant. Since these firms are established, being older than 3 years, at the time of receiving the grant, they are less likely to be receiving a grant for their established business operations. Rather, these recipients are more likely receiving the grants in order to enter a new or emerging market through new product development or marketing strategies. They face decreased risks and, generally, have greater knowledge of a market before entering it relative to start-up firms. Therefore, such high time ratios could be a result of the firm's success track record and that firms are only eligible of certain grants after proving feasibility.

5.2 Conclusions

Though the VAPG is relatively young in age, the grant program has been through some very significant changes so as to better serve the mission of the USDA Rural Business-Cooperative Service in supporting rural business development and value-added agricultural operations. The grant allows for the Service to meet this goal by supporting rural business development through the funding of different projects, including feasibility studies and business plan development. By supporting these important steps of business development, the grant program is able to be more successful by helping the recipients reach past their initial stages of development and improve the survival of funded firms over time. Additionally, this grant aids in reducing the risk for firms entering the market given their respective level of asset fixity and providing capital to regions where firms would otherwise have issues with capital acquisition. Overall, the grant is improving upon previous rural development strategies such as farm subsidies, by providing venture capital to regions with less access to capital and lower salvage values as well as funding a variety of industries.

As the grant has continued to be changed and revised over the years, the true identity and purpose of the grant has become more defined and specific. By implementing such changes, specific groups and projects have been targeted to apply for the grants. This has allowed for the targeting of specific value-added agriculture projects which may otherwise have been overshadowed by projects with higher returns, lower risks or those which aid populations that may otherwise have an advantage. Additionally, the application requirements have evolved as well which helps to better determine which firms will be successful candidates and have the largest effect given the limited budget.

This study shows that, at least from a high level, the VAPG has a positive effect on firm survival (and, potentially, increases a firm's success even if that means a failed feasibility study.) Further definition and refinement of the grant will lead to greater restrictions on eligible applicants, yet at the same time, help to improve the effectiveness of funding successful firms. Access to greater information on the VAPG recipients could aid in determining more about the effect of the two types of grants on firm survival as well as provide more information about the success of a failed feasibility study. If information on the non-funded applicants could be obtained, an even stronger evaluation of the VAPG on firm survival could be performed given that the control groups could be even more tightly defined. Future research may also be directed towards understanding the effect of the grant on firm survival across different industries, determining the most effective funding levels for increasing firm survival, and what implications the grant has on job creation .

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APPENDIX

SUPPLEMENTARY MATERIALS

Table A.1. Changes to USDA VAPG, 2001 to 2016

Year	Annual Appropriations	Total Amount Given	Number of Grants Given	Grant Proposals Submitted	"Value-Added" Guidelines	Eligible Candidates	Preference Groups	Maximum Funding Levels
2001	$20 million[1] ($10 million in round 1, $10 million in round 2)[2]	$20.4 million[3]	63[4]	654[5]	(1) Changes in raw ag produced commodity that results in a higher value[2]	(1) Independent producers[2]	---	$500,000[2]
2002	$33 million[6]	$37.5 million[5]	231[1]	714[3]	(1), (2) Production of product in a manner that enhances its value, (3) Physical segregation of an ag commodity that results in the enhancement of the value of the commodity[6]	(1), (2) Agricultural producer groups, (3) Farmer or rancher cooperatives, (4) Majority-controlled producer-based business ventures[6]	(1) Grants < $500,000, (2) Projects for energy from biomass, (3) Projects demonstrating use of innovative technologies[6]	$500,000[6]
2003	$27.7 million[7]	$28.5 million[3]	193[8]	781[8]	(1), (2), (3)[7]	(1), (2), (3) & (4)[7]	(1), (2), (3)[7]	$500,000[7]
2004	$13.2 million[9]	$15.1 million[8]	97[8]	389[8]	(1), (2), (3) & (4) Economic benefit realized from the production of renewable energy[9]	(1), (2), (3) & (4)[9]	---	$500,000[9]
2005	$14.3 million[10]	$14.8 million[8]	169[8]	381[8]	(1), (2), (3) & (4)[10]	(1), (2), (3) & (4)[10]	---	$100,000 PG^; $150,000 WCG^^[10]
2006	$19.475 million[11]	$21.2 million[8]	185[12]	443[8]	(1), (2), (3) & (4)[11]	(1), (2), (3) & (4)[11]	(4) $1.5 million for recipients with grants of $25,000 or less[11]	$100,000 PG; $300,000 WCG[11]
2007	$19.3 million[13]	$19.5 million[8]	162[14]	381[5]	(1), (2), (3) & (4)[13]	(1), (2), (3) & (4)[13]	---	$100,000 PG; $300,000 WCG[13]
2008	$18.4 million[15]	$18.3 million[8]	144[5]	450[5]	(1), (2), (3) & (4)[15]	(1), (2), (3) & (4)[15]	---	$100,000 PG; $300,000 WCG[15]

Table A.1. Continued

Year	Annual Appropriations	Total Amount Given	Number of Grants Given	Grant Proposals Submitted	"Value-Added" Guidelines	Eligible Candidates	Preference Groups	Maximum Funding Levels
2009*	$18 million[16]	$22.7 million[5]	196[5]	551[5]	(1), (2), (3), (4) & (5) Aggregated and marketed as locally-produced agricultural food products[17]	(1), (2), (3) & (4)[17]	(5) 10% of funds reserved for beginning and social disadvantage farmers/ranchers, (6) 10% of funds reserved for farmers/ranchers proposing mid-tier value chains[†], (7) Priority to small and mid-sized family farms/ranches[17]	$100,000 PG; $300,000 WCG[17]
2010	††							
2011**	$37 million ($19.3 million from Appropriations Act of 2010; $17.9 million from Continuing Appropriations of 2011)[18]	$40.3 million[5]	299[5]	511[5]	(1), (2), (3), (4) & (5)[20]	(1), (2), (3), (4) & (5)[18]	(5), (6), (7) & (8) Encouraging applicants that support communities with limited access to healthy foods and have high poverty rates[18]	$100,000 PG; $300,000 WCG[18]
2012	$14 million[19]					(1), (2), (3) & (4)[19]	(5), (6), (7) & (9) Emphasis on tribal entities[19]	$100,000 PG; $300,000 WCG[19]
2013**	$10.5 million (carry over from 2013)[21]	$18.5 million[22]	119[22]	††	(1), (2), (3), (4) & (5)[21]	(1), (2), (3) & (4)[21]	(5), (6), (7), (9), (10) Preference to Veteran farmers/ranchers, (11) Emphasis on food hubs & (12) Emphasis on bio-based products[21]	$75,000 PG, $200,000 WCG[21]
2014		$16.3 million[23]	146[23]	††				
2015	$30 million ($10.2 million from Consolidated Appropriations Act 2015; $19.8 million carry over from 2014)[24]	$45 million[23]	364[23]	††	(1), (2), (3), (4) & (5)[24]	(1), (2), (3) & (4)[24]	(5), (6), (7), (10), (13) Projects based in or serving census tracts with poverty rates greater than or equal to 20%[24]	$75,000 PG; $250,000 WCG[24]
2016	$44 million ($30.35 from 2014 Farm Bill, $10.75 from Consolidated Appropriations Act, $3 million carry over funds)[25]	††	††	††	(1), (2), (3), (4) & (5)[25]	(1), (2), (3) & (4)[25]	(5), (6), (7) & (9)[25]	$75,000 PG; $250,000 WCG[25]

Note: ^ - PG represents planning grants; ^^ - WCG represents working capital grants.

* - Errors in 2009 posting of Notice of Solicitation for Applications[16] required a withdrawal of notice[26]. Notice to Correct was released in late 2009 with errors[17]. Another Notice to Correct was posted and funds were not awarded until 2010[26]. No new Notice of Solicitation for Applications issued in 2010.

** - Budgetary issues cause the bundling of 2011/2012 grants as well as 2013/2014.

† - The definition of mid-tier value chains as defined by the 2009 Notice of Funds Available released by the USDA's Rural Business-Cooperative Service is as follows: "Local and regional supply networks that link independent producers with businesses and cooperatives that market Value-Added Agricultural Products in a manner that—
(1) Targets and strengthens the profitability and competitiveness of small and medium-sized farms and ranches that are structured as a family farm; and
(2) Obtains agreement from an eligible Agricultural Producer Group, Farmer or Rancher Cooperative, or Majority-Controlled Producer-Based Business Venture that is engaged in the value chain on a marketing strategy.
(3) For Mid-Tier Value Chain projects the Agency recognizes that, in a supply chain network, a variety of raw agricultural commodity and value-added product ownership and transfer arrangements may be necessary. Consequently, applicant ownership of the raw agricultural commodity and value-added product from raw through value-added is not necessarily required, as long as the mid-tier value chain proposal can demonstrate an increase in customer base and an increase in revenue returns to the applicant producers supplying the majority of the raw agricultural commodity for the project."

†† - No information found or information is not yet available.

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Table A.2. Unmatched VAPG recipients, 2001 to 2011

Recipient	Business Description	Grant Year	Grant Purpose	Amount Received
Iowa Recipients				
Central Iowa Soy Producers		2002	Soymilk plant	$50,000
		2007	Marketing of oil-roasted soybean and sweet corn products	$120,361
Country View Dairy, LLC	Dairy farm & retailer	2010 – 2011	Production and marketing of milk products	$86,826
Crosswind Energy, LLC	Wind turbine farm	2005	Feasibility study of wind energy	$87,000
		2006		$300,000
Eagles Landing Winery, LLC	Winery	2006		$100,000
Farmers' All Natural Creamery, LLC	Organic dairy producer	2010 – 2011	Working capital for starting creamery	$280,000
Floyd County Wind	Wind turbine farm	2003	Investigate potential of electrical wind generation	$7,312
Heartland Fish Cooperative	Aquaculture cooperative	2005		$86,325
Iowa Choice Harvest, LLC	Frozen food manufacturer	2010 – 2011	Planning and marketing expenses	$255,284
Iowa Quality Agricultural Guild, LLC		2002		$184,410
Iowa Quality Producers Alliance	Ag. producer group/association	2001		$100,000
Iowa Soybean Promotion Board	Producer marketing group/association	2002		$77,000
Mark Hulsebus (Heartland Fresh Family Farm)	Family farm	2010 – 2011		$13,000
Power Plus Technologies		2002		$500,000
Sean & Becki Sullivan (Juan O'Sullivans Salsa)	Gourmet salsa manufacturer	2009	Add value to producer owned chili peppers	$119,444
Soylink	Farm	2002	Enter emerging soy foods market	$500,000
Summit Grove Winery Cooperative	Grape growers cooperative	2002		$35,300
Swiss Family Farms, Co.	Dairy cooperative	2005	Working capital to expand market of milk	$75,000
Two Rivers Grape and Wine Cooperative	Grape growers cooperative	2003	Construction of winery and production facility	$150,000
Unruh Greenhouse, LLC		2010 – 2011	Processing of local produce for new markets	$49,990
Upper Mississippi Family Meats		2001		$36,300
North Carolina Recipients				
Blue Ridge Shrooms in Bloom, Inc.		2002		$58,368
Tidewater Soy Processors		2002		$21,250

Table A.3. Miscoded VAPG recipients, 2001 to 2011

Recipient	Business Description	NAICS Classification	Grant Year	Amount Received
Iowa Recipients				
BioMass Agri-Products, LLC	Biorefineries for converting feedstocks to fiber-based products	Other scientific and technical consulting services	2001	$470,000
Creative Horizons Producers		All other support services	2003	$50,000
Heartland BioEnergy	Biorefinery with biochar plant	All other basic organic chemical manufacturing	2007	$100,000
Maharishi World Peace Vedic Organics	Non-profit organic farm	Research and development in the physical, engineering, and life sciences	2003	$144,700
Soyex Cooperative		All other support services	2003	$14,900
North Carolina Recipients				
Eastern Foods, Inc.		All other support services	2001	$467,405

Table A.4. Recipients with no control group, 2001 to 2011

Recipient	Business Description	NAICS Classification	Grant Year	Amount Received
Iowa Recipients				
Ag Venture Alliance	Business development organization for value-added agricultural ventures	Portfolio management	2002	$149,000
			2003	$12,500
Corporation of New Melleray	Abbey	Religious organizations	2006	$25,000
Greene Bean Project	Bean producer group in Greene County, IA	Dry pea and bean farming	2002	$12,900
Heartland Fields, LLC		Breakfast cereal manufacturing	2006	$275,000
Schafer Fisheries Iowa, Inc.	Fish processor	Seafood product preparation and packaging	2001	$300,000
Tabor Home Vineyards & Winery	Vineyard and winery	Wineries	2006	$300,000
North Carolina Recipients				
Holly Grove Farms	Goat farm and cheese production	Cheese manufacturing	2008	$68,000

Table A.5. Association recipients, 2001 to 2011

Recipient	Business Description	Grant Purpose	Grant Year	Amount Received
Iowa Recipients				
Grow Your Small Market Steering Committee	Small business class for owners	Develop processing plant for locally grown produce	2007	$68,340
Iowa Cooperative Foundation			2002	$195,000
Iowa Corn Growers Association	Corn marketing group/association		2003	$56,000
Iowa Corn Promotion Board	Corn marketing group/association		2002	$146,550
Iowa Pork Producers Association	Pork marketing group/association		2002	$41,400
Iowa Renewable Fuels Association	Renewable fuels marketing group/association	Support for marketing ethanol and co-products	2002	$48,500
Iowa Wine Trail	Wine marketing group/association	Develop marketing campaign	2007	$28,637
NFO Members Livestock, Inc.	Commodity marketing and ag. risk management services	Feasibility study for value-added beef business	2005	$74,000
Practical Farmers of Iowa	Farming group/association	Value-added pork supply chain	2002	$108,544
North Carolina Recipients				
Independent Small Animal Meat Association of WNC	Independent poultry and meat rabbit processing group/association		2007	$19,500
			2009	$99,710
NC Farm Bureau Foundation for Agriculture in the Classroom	Farming group/association		2003	$53,700
Old North State Winegrowers Cooperative Association, Inc.	Wine marketing group/association		2005	$150,000
Smoky Mountain Native Plants Association	Plant preservation group/association	Develop new ramps products and enhance marketing	2010 – 2011	$20,000
Yadkin Valley Winegrowers Association	Wine marketing group/association		2004	$250,000

Table A.6. Recipients with maturity error, 2001 to 2011

Recipient	Business Description	Grant Purpose	Grant Year	Amount Received
Iowa Recipients				
American Natural Soy Processors, LLC	Organic processor of oils, flour and meal		2001	$478,578
		Value-added soy lecithin processing	2002	$250,000
Asoyia, LLC	Producer of trans-fat free, ultra-low linolenic soybean oils		2006	$25,000
		Marketing of soybean oils	2008	$300,000
Big River Resources Cooperative	Ethanol plant	Working capital for start-up of ethanol plant	2002	$500,000
Eden Farms	All natural Berkshire producers	Marketing Berkshire pork	2002	$31,000
			2004	$147,000
Iowa Quality Beef Supply Network, LLC	Beef harvesting facility		2001	$500,000
			2002	$500,000
Madison County Winery, LLC	Winery	Expand production and sale of wine	2009	$49,960
Midwest Grain Processors	Bioethanol Producer		2003	$500,000
Quad County Corn Processors	Ethanol plant	Working capital grant for start-up of ethanol plant	2001	
			2002	$450,000
Quality Organic Producers Cooperative			2002	$500,000
Soymaize Farms, LLP			2002	$50,000
North Carolina Recipients				
American Prawn Cooperative	Freshwater prawn marketing cooperative	Improve marketing efforts and hire marketing agent	2009	$197,250
Canola Farmers Group	Canola processing	Create business plan to process canola into biodiesel	2008	$100,000

Table A.7. Start-up recipients retained, 2001 to 2011

Recipient	Grant Year	Amount Received	Control Group	Extensions to Control Group
Iowa Recipients				
Absolute Energy LLC	2007	$300,000	CG325193_07_08	includes : 2007 & 2008
Amazing Energy Cooperative Inc	2006	$25,000	CG325193_05	
America's Premium Pork	2005	$105,275	CG311611_05	
Central Iowa Renewable Energy LLC	2004	$139,986	CG325193_05	
	2005	$150,000		
Chariton Valley Beef LLC	2003	$34,158	CG112111_04	
Delaware County Meats LLC	2002	$34,620	CG445210_00	
	2003	$29,439		
	2005	$74,250		
	2007	$10,000		
	2008	$68,000		
East Fork Biodiesel LLC	2007	$89,000	CG325199_07	
Eden Natural LLC	2002	$31,000	CH112210_06	
	2004	$147,000		
Farm Energy LLC	2003	$7,500	CG721191_03	VAPG5dg & includes: 2002, 2003, 2005 & 2006
Four All Seasons LLC	2006	$71,028	CG325314_05	includes: 2003, 2004, 2006 & 2007
Frisian Farms Cheese LLC	2009	$69,000	CG31151_09	VAPG5dg & includes: 2008 & 2010
Golden Grain Energy LLC	2002	$74,000	CG325193_03	includes: 2002
	2005	$150,000		
Grass Run Farm In	2009	$209,724	CG112990_09	
	2010 - 2011	$49,847		
Green Visions Inc	2006	$150,000	CG112210_06	
	2009	$98,312		
Hafner Inc	2010 - 2011	$30,225	CG111998_11	
Hansen's Farm Fresh Dairy	2007	$90,000	CG445299_07	
Homeland Energy Solutions LLC	2008	$300,000	CG325193_06	
Innovative Growers LLC	2003	$51,010	CG31122_01	VAPG5dg & includes: 2002 & 2004
	2006	$300,000		
Iowa Grape Vines Winery LLC	2009	$6,000	CG312130_09	
Iowa Healthy Edge Meats LLC	2007	$47,220	CG445210_07	
Iowa Hops Company	2010 - 2011	$35,340	CG424590_10	
Iowa Premium Pork Company	2001	$500,000	CG311611_01	
Levi Lyle	2009	$16,972	CG111339_10	
Lincolnway Energy LLC	2005	$150,000	CG325193_05	
Little Sioux Corn Processors LLC	2002	$450,000	CG325193_01	
Loren Engelbrecht	2005	$26,500		
	2006	$300,000		
Lutes Family Investments Group	2007	$93,000	CG111998_07	
Maple River Energy LLC	2008	$300,000	CG325199_07	
Midwest Grain Processors Co-Op	2001	$500,000	CG325193_01	
Midwest Pride System LLC	2002	$107,956	CG112210_02	
Moon Valley Vineyard	2004	$25,000	CG312130_05	

Table A.7. Continued

Recipient	Grant Year	Amount Received	Control Group	Extensions to Control Group
Iowa Recipients				
Natural Milk General Partners	2007	$87,500	CG112120_06	
Naturally Iowa Inc	2003	$246,150	CG424490_04	
New Generation Ag Marketing LLC	2003	$500,000	CG424470_03	includes: 2002
	2006	$60,902		
Niman Ranch Pork Cooperative	2004	$250,000	CG424520_05	
Picket Fence Creamery LLC	2004	$43,700	CG424430_05	includes: 2004 & 2006
Pine Lake Corn Processors LLC	2001	$500,000	CG325193_01	
Riceville Meats LLC	2009	$21,850	CG424470_10	includes: 2009 & 2011
Siouxland Energy & Livestock Coop	2001	$500,000	CG325193_01	
	2004	$150,000		
Sirocco LLC	2008	$100,000	CG111998_09	
Small Farmer Produce LLC	2003	$302,000	CG31151_03	VAPG5dg & includes: 2001, 2002 & 2004
Southern Iowa Bioenergy LLC	2005	$100,000	CG325193_06	
Southwest Iowa Renewable Energy	2006	$45,080	CG325193_06	
Terra Renewable Energy LLC	2006	$215,125	CG325193_07_08	includes: 2008
Timber Ridge Dairy	2009	$32,000	CG112120_10	
Two Saints Winery	2010 - 2011	$26,680	CG312130_08	
Vande Rose Foods LLC	2001	$248,000	CG311611_00	
	2006	$300,000		
West Wind Energy LLC	2008	$98,000	CG22111_09	VAPG5dg
Wholesome Harvest Inc	2002	$149,000	CG424490_03	includes: 2002
	2003	$450,000		
Wide River Winery LLC	2008	$25,000	CG312130_06	
Wilrona LLC	2007	$142,300	CG312130_07	
	2009	$90,750		
Winneshiek Wildberry Winery	2005	$30,000	CG312130_06	
World Food Processing LLC	2002	$350,000	CG115114_00	
North Carolina Recipients				
Blue Ridge Food Ventures	2008	$15,500	CG311999_07	
Carolina Dairy Producers Coop Inc	2007	$45,000	CG424430_08	
ECSP LLC	2007	$300,000	CG31122_08	includes: 2007 & 2009
George Foods Inc	2007	$300,000	CG31199_06	VAPG5dg level
Golden Grove Candy Company Inc	2009	$100,000	CG311340_09	
Honey Mountain Farms LLC	2010 – 2011	$120,000	CG112420_08	includes: 2006, 2007, 2009 & 2010
Nooherooka Natural LLC	2010 – 2011	$130,000	CG112111_09	includes: 2007, 2008 & 2010
Red Gate Farms	2004	$50,000	CG112420_04	includes: 2002, 2003, 2005 & 2006
Sullivan Estate Vineyard & Winery	2010 – 2011	$37,148	CG312130_11	
Yamco LLC	2007	$300,000	CG11511_05	VAPG5dg level
	2010 - 2011	$100,000		

Table A.8. Established recipients retained, 2001 to 2011

Recipient	Grant Year	Amount Received	Control Group	Extensions to Control Group
Iowa Recipients				
Batey Ltd	2008	$142,500	CG321113_90	
Cedar Valley Farms LLC	2007	$22,500	CG111998_01	
Farmer's Cooperative Co	2005	$100,000	CG424910_90	
Frank Moore	2006	$255,800	CG111150_90	
Galva Holstein Ag LLC	2002	$75,000	CG424910_90	
Golden Ridge Cheese Cooperation	2004	$500,000	CG424430_01	includes: 2000 & 2002
Iowa Great Lakes Nursery & Floral	2008	$100,000	CG111421_90	
Iowa Lamb Corporation	2001	$437,500	CG311611_90_IA	
Jewell Enterprises Inc	2002	$7,200	CG112330_90	
Kirk Pisel	2010 - 2011	$49,120	CG112112_90	
Max-Yield Cooperative	2004	$50,000	CG424910_99	
Mid-Iowa Cooperative	2003	$450,000	CG424910_99	
Niman Ranch Pork Company LLC	2003	$350,000	CG424520_90	
North Central Cooperative	2002	$32,300	CG424910_90	
Plantpeddler Inc	2009	$139,650	CG111421_90	
Prairie Land Cooperative	2004	$107,000	CG424910_90	
Premium Iowa Pork LLC	2006	$91,000	CG311612_01	
West Bend Elevator Co Inc	2003	$30,500	CG424910_97	
West Central Cooperative	2003	$140,000	CG424910_90	
North Carolina Recipients				
Bailey Foods LLC	2006	$189,021	CG311611_90_NC	
Bobcat Farms LLC	2009	$24,000	CG112111_02	
	2010 - 2011	$140,000		
C L Henderson Produce LLC	2005	$29,600	CG111331_90	
Chapel Hill Creamery LLC	2010 - 2011	$180,000	CG424430_02	
Cottle Strawberry Nursery Inc	2010 - 2011	$300,000	CG444220_94	
Gaia Herbs Inc	2006	$100,000	CG424210_90	
Sleepy Goat Cheese LLC	2010 - 2011	$22,500	CG31151_07	includes: 2006, 2007, 2009 & 2010
Sunburst Trout Company LLC	2010 - 2011	$283,884	CG112511_90	

Table A.9. Description of NAICS codes used for control groups

NAICS Code	Description
111150	Corn farming
111331	Apple orchards
111339	Other non-citrus fruit farming
111421	Nursery and tree production
111998	All other miscellaneous crop farming
112111	Beef cattle ranching and farming
112112	Cattle feedlots
112120	Dairy cattle and milk production
112210	Hog and pig farming
112330	Turkey production
112420	Goat farming
112511	Finfish farming and fish hatcheries
112990	All other animal production
11511	Support activities for Crop Protection
115114	Post-harvest crop activities (except cotton ginning)
22111	Electric power generation
31122	Starch and vegetable fats and oil manufacturing
311340	Non-chocolate confectionery manufacturing
31151	Dairy product (except frozen) manufacturing
311611	Animal (except poultry) slaughtering
311612	Meat processed from carcasses
31199	All other food manufacturing
311999	All other miscellaneous food manufacturing
312130	Wineries
321113	Sawmills
325193	Ethyl alcohol manufacturing
325199	All other basic organic chemical manufacturing
325314	Fertilizer (mixing only) manufacturing
424210	Drugs and druggists' sundries merchant wholesalers
424430	Dairy product (except dried or canned) merchant wholesalers
424470	Meat and meat product merchant wholesales
424490	Other grocery and related products merchant wholesalers
424520	Livestock merchant wholesalers
424590	Other farm product raw material merchant wholesalers
424910	Farm supplies merchant wholesalers
444220	Nursery, garden center, and farm supply stores
445210	Meat markets
445299	All other specialty food stores
721191	Bed-and-breakfast inns