**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**

by

Marcie Stevenson
and
Georgeanne M. Artz

Iowa State University
Ames, Iowa

Paper prepared for the Southern Agricultural Economics Association annual meetings,
Mobile, AL, Feb 4- 7, 2017

**Abstract:** 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. The Value-Added Producer Grant (VAPG) program was established by USDA's Rural Business-Cooperative Service in 2001 to help independent producers and similar organizations develop value-added agricultural businesses, many of which are located in rural areas. 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, we use survival analysis to estimate the effects of a VAPG on firm survival. Recipients are matched with firms in the same industry and state, starting in the same year, who did not receive VAPG funding to estimate the effect of the grant on firm survival. Preliminary results suggest that, after controlling for other characteristics than affect firms survival, receiving a VAPG had a positive and significant impact on firm survival length. For start-up firms, preliminary estimates suggest that survival times are nearly doubled. For more established firms (those that were in business at least three years before receiving a grant), the effects are larger, with survival times increasing 6 times for recipient firms.

## INTRODUCTION

Value-added agriculture has the potential to aid in the development and revitalization of rural economies across the United States. Recent studies have found a variety of positive impacts of value-added agricultural enterprises. For example, Drabenstott & Meeker (1997) show that revenues from value-added agricultural operations are distributed multiple times 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 U.S. Department of Agriculture, as a part of their mission, has been looking to value-added agriculture as a means to support rural regions (Kilkenny & Schluter, 2001).The USDA Value-Added Producer Grant (VAPG), 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 where funding priorities were established. This paper aims to evaluate the impact of the VAPG program on firm survival.

Economic literature on firm survival suggests that age, location, and capital acquisition are key determinants of firm success. Finding ways to reduce barriers to entry for rural start-ups can help boost local economies. Given that the USDA Value-Added Producer Grant program is one form of capital acquisition for rural firms, this study looks to evaluate the grant's impact on firm survival. We use data on grant recipients in Iowa and North Carolina between 2001 to 2011, along with National Establishment Time-Series data from 1990 to 2011. Recipient firms are matched with similar firms that

did not receive a grant to create control groups. These control groups aid in determining the effect of the grant on firm survival as they represent a reasonable approximation of recipient firms' survival had they not received a grant. We conduct survival analysis based on receiving a grant (a form of capital acquisition), as well as firm specific characteristics such as size and location.

Results from our study suggest that receiving a grant has a positive and significant impact on firm survival, especially for 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, increasing the size of the grant does not appear to significantly increase firm survival. In contrast, receiving a relatively small (planning) grant does not have a significant effect on survival.

The paper proceeds as follows. We present a brief review of the literature on the VAPG program and a short description of the grant program's history. Firm survival literature. The next section describes the data and methods used in our analysis. We present the results and then conclude with some policy implications and directions for future research.

## LITERATURE REVIEW

Value-added agriculture has been gaining popularity as a strategy to increase both rural development and agricultural entrepreneurship (Coltrain, Barton, & Boland, 2000; Kilkenny & Schluter, 2001; Womach, 2005); this is driven in part by the diminishing role of production agriculture, as well as increased job loss and reduced workforces in rural areas (Clemens, 2004). Studies conducted on the role of value-added agriculture as a development strategy for rural areas have documented positive impacts on economic growth. Monchuk's (2006) 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 than from their peers who did not. Additionally, increased revenues are distributed

throughout the community from value-added agricultural operations (Drabenstott & Meeker, 1997). Counties with greater reliance on agriculture displayed slower 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[1]. First, the "typical" form of value-added agriculture consists of raw product processing with often involves some degree of vertical integration (Brees, Parcell, & Giddens, 2010; Coltrain, Barton, & Boland, 2000; Amanor-Boadu, 2003). 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). An althernative concept of value-added agriculture includes 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; Born, 2001).

When considering a value-added agricultural enterprise, 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).

---

[1] There is not one common definition of value-added agriculture. 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).

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 by providing funds for the planning and capital investment of such operations (Leval, Tuttle, & Bailey, 2005; Young, 2006). The VAPG is a competitive grant administered through the USDA's Rural Business-Cooperative Service to support value-added agricultural operations. The VAPG is one of many programs that the USDA Rural Business-Cooperative Service employs to achieve their mission of supporting rural business development.

The 2016 VAPG NOFA invited applications from independent producers, agricultural producer groups, farmer and rancher cooperatives, and majority-controlled producer-based businesses. Grant funding priorities include producers with small and medium-sized operations, especially those operating as a family farm or ranch. Ten percent of funds were reserved for beginning, veteran, and socially-disadvantaged farmers or ranchers. Another ten percent was held for producers proposing projects which develop mid-tier value chains[2]. Grant funds can be used for starting or expanding processing or marketing initiatives for value-added agricultural products (Rural Business-Cooperative Service, 2016).

---

2 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."

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 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).

**Previous Analyses of the USDA VAPG**

A handful of studies have examined the effects of the USDA's 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).

Boland, Crespi, and Oswald (2009) and an update by Schenheit (2013) aimed to determine the impact of VAPG on business success in terms of growth through nine start-up business steps. They found that large firms are more likely to receive a VAPG 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. 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.)

Neither Boland, et al (2009) nor Schenheit (2013) used control groups to establish a benchmark for success without grant funding. In this study, we matched recipient firms to similar firms who did not received a VAPG in order to create a counterfactual of 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. To the best of our knowledge, 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.

**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. 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).

Results from a number of survival analysis studies establish hazard rates, the probability of a firm failing, are the highest when a firm is new (a start-up) and decline as the firm ages and is producing closer to the minimum efficient scale (Audretsch & Mahmood, 1995; Disney, Haskel, & Heden, 2003). Firm risk decreases as the firm ages (Dunne, Roberts, & Samuelson, 1989; Audretsch D. B., 1991; Baldwin & Gorecki, 1991). 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). 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 technological changes in the industry (Utterback & Abernathy, 1975; Gort & Klepper, 1982; Banbury & Mitchell, 1995; Christensen, 1997).

Another factor affecting firm survival is firm location. New firms are highly susceptible to the local economic environments and markets (Renski & Wallace, 2013). Generally, metropolitan areas are viewed as more conducive to entrepreneurship (Monchuk, 2006; Renski H. , 2008). Firms in urban areas can 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).

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).

Despite these apparent barriers for rural firm start-ups, research suggests rural firms survive at least as long as their urban peers. Some studies document little difference between survival rates of new firms between urban and rural areas (Reynolds, 1987; Buss & Lin, 1990; Forsyth, 2005). Other find rural firms survive longer (Stearns, Carter, Reynolds and Williams, 1995; Yu, Orazem, and Jolly; 2009).

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 and even grant provided requires specific conditions be met (Markley, 2001; Richards & Bulkley, 2007; 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).

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) argue institutions and agencies are needed to help improve the flow of capital into rural regions and firms. When producers of niche products receive capital, there is a spillover effect on the rural communities in which these firms are located, aiding more than just the firm originally funded (Van Auken & Carraher, 2012).

Compounding the problem of acquiring adequate capital during the start-up or expansion phases, rural firms may also face an asset fixity problem[3]. Ward and Hite cite asset fixity as a reason for the lack of autonomous rural development across regions (1999). 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 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[4]. Rural firms must in turn have a higher probability of success to justify the initial investment in the firm. 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).

This paper evaluates the effect of receiving a VAPG, a form of capital acquisition, on firm survival. We compare VAPG recipients to a non-receiving peer group using the survival analysis method. Schenheit (2013) notes several reasons why it is difficult to determine the success of the

---

[3] 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). 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. Slow exit rates for farmers in the dairy industry (Foltz, 2004) and the delayed response of hog production to changes in pork prices (Boetel, Hoffman, and Liu, 2007) have been explained by asset fixity. Wlodarz (2013) concluded that one of the major barriers to ethanol production was asset fixity given the limited ability to utilize production facilities or convert assets to handle different inputs after failure of the initial operation.

[4] These large investments with low salvage values can be viewed as a sunk cost (Johnson & Quance, 1972; Abel & Eberly, 1994; Chavas, 1994); therefore profit-maximizing firms will not take them into account in the decision to continue producing.

USDA's VAPG: (1) the grant evolving over is 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. We have addressed some of these challenges. First, we divide the dataset into two subsets: start-up firms and established firms and analyze them separately. Second, our use of control groups, created by matching characteristics of VAPG recipients with characters of non-recipient peer firms, helps to account for heterogeneity among firms. 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.

DATA

We use 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 to analyze the impact of the VAPG on firm survival. Each recipient firm is matched with non-recipient peers with similar characteristics. The difference in outcomes between the treatment and control groups represents the effect of the VAPG on firm survival.

The data on VAPG recipients was created and released for use by Dr. Michael Boland[5]. The dataset contains information about recipients of the VAPG from 2001 to 2011 and includes information on the name of the recipient, the year the grant was received, the location of the business, and the grant amount awarded.

[5] 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).

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[6]. The average grant size was $146,173, though grants ranged in size from $1,250 to $500,000. Table 1 lists the states awarded the most number of grants, as well as the data for North Carolina.

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

| State | Number of Grants | Average Grant Value |
|---|---|---|
| **Top 5 States** | | |
| 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 |

Iowa has the greatest number of recipients, grants, and total grant dollars awarded over the life of the grant. Other Midwestern states with commodity based agriculture rank in the top five states for all three categories along with California and Oregon. 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).

**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-

[6] 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.

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 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[7]), and industry (provided by the North American Industry Classification System[8]) (Walls & Associates, 2011). Other studies have used NETS data to study business and entrepreneurship topics ( Neumark, Wall, and Zhang, 2011; Goetz, Flemming, and Rupasingha, 2012). Like most datasets, the NETS data have limitations; however, it is considered one of the best sources of longitudinal data for analyzing firm survival (Reedy, 2011).

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, before the VAPG program began in 2001. Our access to the NETS data is limited to Iowa and North Carolina, but it is likely the results of the study will generalize to other regions of the United States. Iowa ranks first in number of VAPG grants received while North Carolina falls somewhere in the middle. The two states are geographically different, and while they have some agricultural industries in common (hogs, for example), their agricultural industries differ in many aspects as well. Both states have emerging agricultural industries during the study period. 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

[7] 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.

[8] 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.

farmers interested in marketing value-added crops through farmer's markets, producer-owned cooperatives, and other similar outlets.

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[9]. The NAICS codes (six-digit industry codes) for matched recipient firms in the NETS data were checked to make sure they appropriately reflected the primary purpose of the firm based on the firm's website. We classified firms whose NAICS codes were not appropriately identified in the NETS data to better reflect the industry in which the firm operates[10]. Firms which were miscoded, but could not be adequately recoded were removed[11]. 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.

We constructed control groups for each of the recipients. By pairing the treatment group with a set of non-recipient peers, we can compare the outcomes of the two groups to estimate 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

---

[9] 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.

[10] 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.

[11] 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.

treatment group as possible. Comparison group design can also be very useful in building a simple enough story to communicate research findings to the public or policymakers (Henry, 2010).

Our control groups are comprised by peer firms from the same state, which started in the same year, and have the same NAICS code (or are operating in the same industry.) We required each control group to contain at least three non-recipient peers[12]. 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[13] or included firms in the same industry that started up to two years before or after the recipient firm[14]. We did not allow matching across states. That is, all Iowa recipients are matched only with other Iowa firms and all North Carolina recipients are matched with other North Carolina firms. Due to the inability to create a control group, 6 (4.9%) recipients in Iowa were removed while 1 (3.4%) North Carolina recipient was removed. We also removed commodity groups and agricultural associations from our sample given that associations can vary greatly, especially in terms of funding sources, and operate differently than a typical firm. Iowa had 9 (7.4% of recipients) associations which were removed while North Carolina had 5 (17.2% of recipients)[15].

To distinguish between the types of grants received and the timing of when firms received funding from the VAPG program, we created a variable indicating 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. We

---

[12] 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.

[13] 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.

[14] 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.

[15] 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.

analyzed the two groups separately since survival rates for firms improve after three years and because capital acquisition can play different roles in different phases. In a few cases, we could not determine the age of the firm and so these firms were dropped from our sample[16]. We removed 10 Iowa recipients (8.3%) and 2 North Carolina recipients (6.9%) for this reason.

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[17]. 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 2 provides more details about the sample firms. The majority of firms are small (fewer than 11 employees in the first year) for both the start-up and established subsets. Small firms make up 81% and 63% of the recipient firms and 98% of control group firms. This is not surprising given firms likely start small and add employees over time. While one of the aims of the VAPG program is rural development, not all grant recipients are located in rural counties. The bottom rows of table 2 provide a breakdown of recipient and control group locations, categorized by ERS's rural-urban continuum codes: Metro counties (codes 1-3); non-metro adjacent counties (codes 4,6, and 8) and non-metro, non-adjacent counties (codes 5, 7, and 9). While the majority of firms are located in non-metropolitan counties, just under 30 percent of the recipient firms in the start-up category are located in metropolitan counties and about 15% of the established firms are in metro counties.

---

[16] 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.

[17] We compared the geographic distribution and the average grant received for the firms removed from the sample with firms retained. The firms were similarly distributed across metro and non-metro counties. In addition the average grant sizes were also similar in magnitude.

**Table 2. Characteristics of sample treatment and control firms by age of firm**

| | Start-up Firms | | | | Established Firms | | | |
|---|---|---|---|---|---|---|---|---|
| **Category** | **Treatment** | | **Control** | | **Treatment** | | **Control** | |
| | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** |
| Number | **63** | | **4,661** | | **27** | | **24,781** | |
| | | | | | | | | |
| Firm Size (first year employment) | | | | | | | | |
| Small (<11 employees) | 51 | 81% | 4,612 | 98.9% | 17 | 63.0% | 24,315 | 98.1% |
| Medium (11 to 50 employees) | 12 | 19% | 38 | 0.8% | 9 | 33.3% | 398 | 1.6% |
| Large (>50 employees) | 0 | 0.0% | 11 | 0.2% | 1 | 3.7% | 68 | 0.3% |
| Location | | | | | | | | |
| Metro | 18 | 28.6% | 1,709 | 36.7% | 4 | 14.8% | 6,048 | 24.4% |
| Non-metro, Adjacent | 27 | 42.9% | 1,666 | 35.7% | 10 | 37.0% | 9,592 | 38.7% |
| Non-metro, Non-adjacent | 18 | 28.6% | 1,286 | 27.6% | 13 | 48.1% | 9,141 | 36.9% |

METHODS

We use survival analysis to determine the difference in survival rates of VAPG recipients relative to similar non-recipient firms as a measure of the grant's role in firm success. Each firm $i$ has a survival duration, *T*, which represents the length of time a firm stays 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[18]. This hazard function provides the rate at which a firm exits per unit of time *t*, in this study time is measured in years. We assume a log-logistic distribution for the

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

model to mimic the empirical evidence that suggests the probability of exit is initially increasing (up to 3 – 5 years) and thereafter declines.[19]

Firm *i's* survival rate depends on its characteristics and other market factors, $x_i$. We observe the values of these explanatory factors at the time of start-up. The survival for firm *i* is:

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

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[20]. This function is non-increasing. The coinciding density function of the survival duration *T* is as follows:

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

If the estimated coefficient, $\beta_j$, is positive, an increase in $x_j$, holding all other variables constant, implies a decline in the failure rate (or an increase in the probability of firm survival). Alternatively, if $\beta_j$ is negative, increasing $x_j$ will result in an increase in the hazard rate (or decrease in the probability of survival).

Assuming the scale parameter, γ, is between zero and one, the log likelihood estimation is:

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

where $d_i$ represents a dummy variable indicating if the firm exits.

We add a frailty parameter, α, to allow heterogeneity among the survival of the observations due to different 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

[19] Such studies include Jovanovic (1982), Geroski (1995), Caves (1998), and Audretsch, Santarelli,,and Vivarelli (1999).
[20] 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.

survival analysis model since it allows 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)*. If α > 1, the firms experience more risk uncorrelated with their characteristics, $x_{ij21}$. 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.

We represent *g(α)* with the Inverse-Gaussian distribution.[22] This distribution allows the firms to become more homogeneous over time relative to other possible distributions[23] (Hougaard, 1986). We can incorporate the probability density function into our survival function:

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

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.

---

21 This increased risk could be a result of inclement weather, poor management, bad luck, lacking technology and other unobserved factors.

22 Distribution has a mean equal to one and variance equal to θ. With $\theta \neq 0$, the unobserved risk of failure between firms differs.

23 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).

## EMPIRICAL STRATEGY

We estimate survival analysis models by subset (start-up firms and established firms). We include a dummy variable, *VAPG*, which is equal to 1 if a firm received a VAPG grant and 0 otherwise. We also include the amount of the first grant received, *VALUE*, measured in thousands of dollars. Our vector of firm characteristics include dummy variables for firm size (measured by first year employment) and for location (metropolitan, non-metropolitan adjacent and non-metropolitan, non-adjacent. These variables are summarized in table 3. 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. We also include fixed effects for our comparison groups. Model (2) adds interaction variables between location and *VAPG* to test whether the effect of the grant varies by firm location. Model (3), adds a state interaction variable to test if the effects vary between Iowa and North Carolina. The next two models focus on aspects related to the amount of money received from the grant. In model (4), we include a variable, $MULTI_¸$ to test if there is an added impact of receiving multiple VAPG's and include the total value of all VAPG's received, *TOTVALUE*. Lastly, in model (5), we add a proxy for receiving a planning grant (versus a working capital grant) by including a dummy variable that equals 1 if the size of the grant received was less than $75,000.

We report our results in the form of time ratios which are more intuitive that the survival analysis parameters. A one unit increase in $x_i$, using the time ratio, is interpreted as increasing the survival time by $e^{\beta_i}$ times over the base scenario. For example, if $e^{\beta_i}$ = 2.03, then a one unit increase in $x_i$ would increase the survival time by 2.03 times. Values for $e^{\beta_i}$ greater than one have a positive effect on the survival time while those less than one have a negative effect.

## RESULTS

Tables 4 and 5 present the results. In general, receiving a VAPG improved the likelihood of survival for firms in both subsets. The interpretation of the role of the VAPG on established firm survival is less clear, however. Established firms receiving grants are likely using the VAPG to develop a new project or spin-off from current operations 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

**Table 3. 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 |
| 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 | 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 | 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 |
| VAPG_PG | Grants ≤ $75,000 | 1 if VALUE ≤ $75,000, 0 otherwise | 0.006 | 0.075 | 0.000 | 0.020 |

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

The start-up firm results are provided in table 4. Receiving a VAPG has a positive and significant (or very close to significant) impact on firm survival. 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. This suggests that, conditional on year of entry, state and industry, firm size and rural/urban location do not significantly impact survival time.

The base case in the model is a small, metro, non-recipient firm. Relative to the base, a VAPG recipient firm's survival time is increased by roughly 2 times. . Conditional on receiving a grant, the value of the first grant received (in $100,000 increments) has a positive, but insignificant impact on overall survival. The joint test of significance (*VAPG + VALUE*) for model (1), does suggest that the size of the grant has an added positive, although small, effect on firm survival. While the grant has positive and significant impacts on firm survival across locations, the size of the effect does not vary from more rural to more urban locations. When we incorporate a state fixed effect (model (3)), the results suggest that the grant does lowers survival in North Carolina operations, although the effect is not statistically significant. Receiving multiple VAPG's (model (4)), does seem to increase firm survival relative to a one-time VAPG recipient. The joint test of significance for (*VAPG + MULTI)* implies that firms survive 3 times as long as the base firm when they receive multiple grants. Lastly, conditional on having received a VAPG, receiving a VAPG less than or equal to $75,000 (our 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 (our proxy for a working capital grant).

Established Firms

We report only the base model for the established firm subset in table 5 due to estimation errors. A correlation matrix determined that several variables in the model were highly correlated. This will require further investigation. As in the start-up firm subset, receiving a VAPG significantly increased firm survival time for more established firms. For established firms, however, the effect is much larger; results suggest that receiving a VAPG increased survival by 6.65 times relative to a small, metro, non-recipient firm. 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. These firms older, more well-established firms use the VAPG grant differently than do start-up firms. Conditional on having received a VAPG, increasing value of the first grant seems to lower firm survival somewhat (relative to receiving a smaller grant); the implied effect on survival from the joint test of significance for *VAPG + VALUE* is 5.7 years.

**Survival time estimates**

We predicted the median survival time for firms who received a VAPG and those who did not by VAPG value levels and for the control group. Our results, as presented in table 6, show that medium sized grant recipients survive the longest, followed by small grant recipients. Those firms receiving a large grant had the shortest estimated median survival time among VAPG recipients, yet their 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 4. Results of start-up firm subset survival models**

| Variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| VAPG | 1.88* | 1.99 | 2.31* | 1.68 | 3.25** |
| | (2.25) | (1.47) | (2.39) | (1.76) | (2.61) |
| VALUE | 1.03 | 1.02 | 0.99 | | 0.90 |
| | (0.35) | (0.18) | (-0.12) | | (-0.81) |
| SIZE_M | 1.29 | 1.26 | 1.30 | 1.29 | 1.30 |
| | (1.28) | (1.16) | (1.31) | (1.33) | (1.39) |
| SIZE_L | 1.02 | 1.01 | 1.02 | 1.01 | 1.02 |
| | (0.06) | (0.05) | (0.06) | (0.03) | (0.08) |
| NMA | 1.03 | 1.03 | 1.03 | 1.03 | 1.03 |
| | (0.51) | (0.53) | (0.46) | (0.52) | (0.50) |
| NMNA | 0.98 | 0.98 | 0.98 | 0.98 | 0.97 |
| | (-0.39) | (-0.42) | (-0.40) | (-0.37) | (-0.43) |
| TOTVALUE | | | | 1.03 | |
| | | | | (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) | |
| VAPG_PG | | | | | 0.37 |
| | | | | | (-1.74) |
| constant | 3.14** | 3.12** | 3.21** | 3.17*** | 3.05** |
| | (2.93) | (2.90) | (2.96) | (2.94) | (2.78) |
| gamma | 0.17*** | 0.17*** | 0.17*** | 0.17*** | 0.17*** |
| theta | 31.16*** | 31.27*** | 31.32*** | 29.56*** | 30.20*** |
| N | 4724 | 4724 | 4724 | 4724 | 4724 |
| Log likelihood | -696.05 | -695.99 | -695.06 | -694.86 | -694.40 |
| chi2 | 104.51 | 104.64 | 106.50 | 106.90 | 107.81 |
| **Joint tests of significance** | | | | | |
| *VAPG + VALUE* | 1.94*** | | | | |
| | (3.09) | | | | |
| *VAPG + VAPG_NMA* | | 1.82** | | | |
| | | (2.00) | | | |
| *VAPG + VAPG_NMA+ VALUE* | | 1.86** | | | |
| | | (2.38) | | | |
| *VAPG + VAPG_NMNA* | | 2.09* | | | |
| | | (1.72) | | | |
| *VAPG + VAPG_NMA+ VALUE* | | 2.14** | | | |
| | | (2.05) | | | |
| *VAPG+VAPG_NC* | | | 0.79 | | |
| | | | (-0.37) | | |
| *VAPG+VAPG_NC+VALUE* | | | 0.78 | | |
| | | | (-0.37) | | |
| *VAPG + MULTI* | | | | 3.08* | |
| | | | | (1.68) | |
| *VAPG + MULTI+TOTVALUE* | | | | 3.17* | |
| | | | | (1.97) | |
| *VAPG + VAPG_PG* | | | | | 1.19 |
| | | | | | (0.43) |
| *VAPG + VAPG_PG+VALUE* | | | | | 1.07 |
| | | | | | (0.17) |

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

**Table 5. Results of established firm subset survival models**

| Variable | (1) |
|---|---|
| VAPG | 6.65** |
| | (2.88) |
| VALUE | 0.86 |
| | (-0.56) |
| SIZE_M | 1.67*** |
| | (7.25) |
| SIZE_L | 1.00 |
| | (0.00) |
| NMA | 1.02 |
| | (0.87) |
| NMNA | 0.97 |
| | (-1.62) |
| constant | 14.56*** |
| | (11.27) |
| gamma | 0.59*** |
| theta | 0.69* |
| N | 24,808 |
| Log likelihood | -27370.50 |
| chi2 | 1053.60 |
| **Joint tests of significance** | |
| *VAPG + VALUE* | 5.73*** |
| | (3.71) |

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

**Table 6. Median survival time estimation results by subset and frailty condition**

| Start-Up Subset Median Survival Time Prediction Results | | | | | |
|---|---|---|---|---|---|
| **Unobserved Frailty** | | | | | |
| **Case** | **Obs.** | **Mean** | **Std. Dev.** | **Min.** | **Max.** |
| Non-recipient | 4,661 | 125.32 | 97.59 | 4.506 | 1,162.54 |
| Recipient, Value ≤ $35,000 | 16 | 122.54 | 198.58 | 20.61 | 590.28 |
| Recipient, Value > $35,000 & ≤ $250,000 | 32 | 261.15 | 504.30 | 8.672 | 2123.87 |
| Recipient, Value > $250,000 | 15 | 109.90 | 304.35 | 18.26 | 1209.60 |
| **Conditional Frailty Equal to 1** | | | | | |
| **Case** | **Obs** | **Mean** | **Std. Dev.** | **Min.** | **Max.** |
| Non-recipient | 4,661 | 31.08 | 24.20 | 1.12 | 288.31 |
| Recipient, Value ≤ $35,000 | 16 | 30.39 | 49.25 | 5.11 | 146.39 |
| Recipient, Value > $35,000 & ≤ $250,000 | 32 | 64.76 | 125.07 | 2.15 | 526.72 |
| Recipient, Value > $250,000 | 15 | 27.26 | 75.48 | 4.53 | 299.98 |
| **Established Subset Median Survival Time Prediction Results** | | | | | |
| **Unobserved Frailty** | | | | | |
| **Case** | **Obs** | **Mean** | **Std. Dev.** | **Min.** | **Max.** |
| Non-recipient | 24,781 | 23.42 | 4.98 | 4.438 | 63.75 |
| Recipient, Value ≤ $35,000 | 7 | 88.72 | 38.49 | 29.076 | 146.88 |
| Recipient, Value > $35,000 & ≤ $250,000 | 13 | 99.86 | 47.38 | 26.073 | 223.17 |
| Recipient, Value > $250,000 | 7 | 64.32 | 22.43 | 34.894 | 107.03 |
| **Conditional Frailty Equal to 1** | | | | | |
| **Case** | **Obs** | **Mean** | **Std. Dev.** | **Min.** | **Max.** |
| Non-recipient | 24,781 | 19.57 | 4.17 | 3.71 | 53.27 |
| Recipient, Value ≤ $35,000 | 7 | 74.13 | 32.16 | 24.29 | 122.72 |
| Recipient, Value > $35,000 & ≤ $250,000 | 13 | 83.44 | 39.58 | 21.78 | 186.46 |
| Recipient, Value > $250,000 | 7 | 53.74 | 18.74 | 29.16 | 89.43 |

## SUMMARY AND CONCLUSIONS

We find evidence that receiving a VAPG has a positive and significant effect on firm survival for both start-up and established firms, though the interpretation for established firms is less clear. Rural/urban firm location does not appear to affect the impact of the grant; however our estimates suggest that the grant is less effective in North Carolina than in Iowa.

Recipients of smaller VAPGs (< $75,000) did not survive significantly longer that their non-recipient peers. This may be explained by the types of projects funded under the two different grant types. 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, this is a successful use of the grant 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. Since these firms are more established at the time of receiving the grant, they are more likely receiving the grant 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 relative to start-up firms. Therefore, such high time ratios could be a result of the firm's successful track record and the fact that firms are only eligible for certain grants after proving eligibility.

This analysis suggests that the VAPG grant program has been able to successfully help recipients past the initial stages of business development and improve the survival of funded firms over time. Over time, specific groups and projects have been targeted for the VAPG funding. Future work might examine whether the grant has different impacts on these targeted groups relative to non-targeted recipients. 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 precisely 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 .

# REFERENCES


Agarwal, R., & Gort, M. (1996). The Evolution of Markets and Entry, Exit, and Survival of Firms. *The Review of Economics and Statistics, 78*(3), 489 - 498.

Amanor-Boadu, V. (2003). Preparing for Agricultural Value-Adding Business Initiatives: First Things First. Manhattan, Kansas: Agricultural Marketing Resource Center, Department of Agricultural Economics, Kansas State University.

Atkinson, R. (2004). Reversing Rural America's Economic Decline: The Case for a National Balanced Growth Strategy. Washington, D.C.: Progressive Policy Institute.

Audretsch, D. (1991). New Firm Survival and the Technological Regime. *Review of Economics and Statistics*, 441 - 450.

Audretsch, D., & Mahmood, T. (1995). New Firm Survival: New Results Using a Hazard Function. *Review of Economics and Statistics, 77*, 97 - 103.

Audretsch, D., Santarelli, E., & Vivarelli, M. (1999). Start Up Size and Industrial Dynamics: Some Evidence from Italian Manufacturing. *International Journal of Industrial Organization, 17*, 965 - 983.

Baldwin, J. R., & Gorecki, P. K. (1991). Firm Entry & Exit in the Canadian Manufacturing Sector. *Canadian Journal of Economics*, 300 - 323.

Banbury, C., & Mitchell, W. (1995). The Effects of Introducing Important Incremental Innovation on Market Share and Business Survival. *Strategic Management Journal*, 161 - 182.

Barkley, D. (2003). Policy Options for Equity Financing for Rural Entrepreneurs. *Main Streets of Tomorrow: Growing and Financing Rural Entrepreneurs*, 97 - 105. (M. Drabenstott, Ed.) Kansas City, MO: Center for the Study of Rural America, Federal Reserve Bank of Kansas City.

Boland, M. A., Crespi, J. M., & Oswald, D. (2009). An Analysis of the 2002 Farm Bill's Value-Added Producer Grant Program. *Journal of Agribusiness, 27*(1), 107 - 123.

Born, H. (2001). Keys to Success in Value-Added Agriculture. *Appropriate Technology Transfer for Rural Areas*. National Center for Appropriate Technology.

Brees, M., Parcell, J., & Giddens, N. (2010). Capturing vs. Creating Value. *MU Agricultural Guide*. University of Missouri Cooperative Extenstion.

Buss, T. F., & Lin, X. (1990). Business Survival in Rural America: A Three State Study. *Growth and Change, 21*(3), 1 - 8.

Cassar, G. (2004). The Financing of Business Start-Ups. *Journal of Business Venturing*, 19.

Caves, R. (1998). Industrial Organization and New Findings on the Turnover and Mobility of Firms. *Journal of Economic Literature, 36*(4), 1947 - 1982.

Christensen, M. (1997). The Innovator's Dilemma. Harvard Business School Press.

Clemens, R. (2004). Keeping Farmers on the Land: Adding Value in Agriculture in the Veneto Region of Italy. *MATRIC Briefing Paper 04-MBP 8*. Ames, Iowa: Midwest Agribusiness Trade Research and Information Center, Iowa State University.

Coltrain, D., Barton, D., & Boland, M. (2000). Value Added: Opportunities and Strategies. Arthur Capper Cooperative Center, Department of Agricultural Economics, Kansas State University.

Dabson, B. (2001). Supporting Rural Entrepreneurship: Exploring Policy Options for a New Rural America. Kansas City, MO: Center for the Study of Rural America, Federal Reserve Bank of Kansas City.

Disney, R., Haskel, J., & Heden, Y. (2003). Entry, Exit, and Establishment Survival in UK Manufacturing. *Journal of Industrial Economics, 101*, 91 - 112.

Drabenstott, M. (2003). A New Era for Rural Policy. *Economic Review: Federal Reserve Bank of Kansas City, 88*(4), 81 - 98.

Drabenstott, M., & Meeker, L. (1997). Financing Rural America. *Economic Review*.

Dunne, T., Roberts, M. J., & Samuelson, L. (1989). The Growth and Failure of U.S. Manufacturing Plants. *Quarterly Journal of Economics*, 672 - 698.

Ernst, M., & Woods, T. (2011). Adding Value to Plant Production - An Overview. Cooperative Extension Service, College of Agriculture, University of Kentucky.

Esteve-Perez, S., & Manez-Castillejo, J. (2008). The Resource-Based Theory of the Firm and Firm Survival. *Small Business Economics, 30*, 231 - 249.

Forsyth, G. D. (2005). A Note on Small Business Survival in Rural Areas: The Case of Washington State. *Growth and Change, 36*(3), 428 - 440.

Geroski, P. (1995). What Do We Know About Entry? *International Journal of Industrial Organization, 13*(4), 421 - 440.

Goetz, S. J., Flemming, D. A., & Rupasingha, A. (2012). The Economic Impacts of Self-Employment. *Journal of Agricultural and Applied Economics, 44*(3), 315 - 321.

Goreham, G. (2005). Farm Credit Services and Social Capital in Rural Communities. *Farm Credit Horizons*. Department of Rural Sociology, North Dakota State University.

Gort, M., & Klepper, S. (1982). Time Paths in the Diffusion of Product Innovations. *The Economic Journal*, 630 - 653.

Gutierrez, R. (2002). Parametric Frailty and Shared Frailty Survival Models. *The State Journal, 2*(1), 22 - 44.

Hardesty, S. (2010). Do Government Policies Grow Local Food. *Choices*.

Henry, G. T. (2010). Comparison Group Designs. In J. S. Wholey, H. P. Hatry, & K. E. Newcomer, *Handbook of Practical Program Evaluation* (3rd ed., pp. 137 - 151). San Francisco, CA: Jossey-Bass.

Holmes, P., Hunt, A., & Stone, I. (2010). An Analysis of New Firm Survival Using a Hazard Function. *Applied Economics, 42*(2), 185 - 195.

Hoover, E., & Vernon, R. (1959). Anatomy of a Metropolis; The Changing Distribution of People and Jobs Within the New York Metropolitan Region. Cambridge, MA: Harvard University Press.

Hougaard, P. (1986). Survival Models for Heterogeneous Populations derived from Stable Distributions. *Biomentrika, 73*(2), 387 - 396.

Hunt, R. D. (2002). Century's End. In *Problems of Plenty: The American Farmer in the Twentieth Century* (pp. 154 - 173). Chicago, IL: Ivan R. Dee.

Jovanovic, B. (1982). Selection and Evolution of Industry. *Econometrica, 50*, 649 - 670.

Key, N., & Roberts, M. (2006). Government Payments and Farm Business Survival. *American Journal of Agricultural Economics, 88*(2), 382 - 392.

Kilkenny, M., & Schluter, G. (2001). Value Added Agriculture Policies Across the 50 States. *Rural America, 16*(1), 12 - 18.

Korsching, P., & Jacobs, C. (2005). Farmer Entrepreneurship: Problems and Prospects of Growing a Business on the Farm. *Sociology Research Briefs*. Ames, Iowa: Iowa State University.

Lee, H. (2012). The Role of Local Food Availability in Explaining Obesity Risk Among Young School-Aged Children. *Social Science & Medicine, 74*(8), 1193 - 1203.

Leone, R., & Struyk, R. (1976). The Incubator Hypothesis: Evidence from 5 SMSAs. *Urban Studies, 13*(3), 325 - 331.

Leval, K., Bailey, J., Powell, M., & Tuttle, A. (2006, August). The Impact and Benefits of USDA Research and Grant Programs to Enhance Mid-Size Farm Profitability and Rural Community Success. Lyons, NE: Center for Rural Affairs.

Leval, K., Tuttle, A., & Bailey, J. (2005, September). Building Wealth in Rural Communities: USDA'S Value-Added Producer Grant Program. Lyons, NE: Rural Research and Analysis Program; Center for Rural Affairs.

Liang, C. (2015). What Policy Options Seem to Make the Most Sense for Local Food? *Choices*.

Lu, R., & Dudensing, R. (2015). What Do We Mean by Value-Added Agriculture. *Choices, 30*(4).

Markley, D. (2001). Financing the New Rural Economy. *Exploring Policy Options for a New Rural America*, 69 - 80. (B. Dabson, Ed.) Kansas City, MO: Center for the Study of Rural Ameria, Federal Reserve Bank of Kansas City.

Monchuk, D. (2006). An Analysis of Regional Economic Growth in the U.S. Midwest. *Review of Agricultural Economics, 29, 1*, 17 - 39.

National Commission on Small Farms. (1998). *A Time to Act.* U.S. Department of Agriculture. U.S. Department of Agriculture.

Neumark, D., Wall, B., & Zhang, J. (2011). Do Small Businesses Create More Jobs? New evidence for the United States from the Nation Establishment Time-Series. *The Review of Economics and Statistics, 93*(1), 16 - 29.

Onken, K., & Bernard, J. (2010). Catching the "Local" Bug: A Look at State Agricultural Marketing Programs. *Choices*.

Reedy, E. J. (2011, April 29). *The Best Uses of NETS*. (Ewing Marion Kauffman Foundation) Retrieved from Growthology: Exploring Entrepreneurship Research: http://www.kauffman.org/blogs/growthology/2011/04/the-best-uses-of-nets

Renski, H. (2008). New Firm Entry, Survival, and Growth in the United States: A Comparison of Urban, Suburban, and Rural Areas. *Journal of the American Planning Association, 75*(1), 60 - 77.

Renski, H., & Wallace, R. (2013). Entrepreneurship in Rural America. In S. B. White, & Z. Z. Kotval (Eds.), *Financing Economic Development in the 21st Century* (2nd ed., pp. 245 - 279). M.E. Sharpe.

Reynolds, P. D. (1987). New Firms: Societal Contribution versus Survival Potential. *Journal of Business Venturing, 2*, 231 - 246.

Richards, S., & Bulkley, S. (2007). Agricultural Entrepreneurs: The First and the Forgotten? *Hudson Institute Center for Employment Policy*.

Risch, C. C., Boland, M. A., & Crespi, J. M. (2014). Survival of U.S. Sugar Beet Plants from 1897 to 2011. *Agribusiness*, 1 - 13.

Rubin, J. (2010). Venture Capital and Underserved Communities. *Urban Affairs Review, 45*(6), 821 - 835.

Rural Business-Cooperative Service. (2001, March 6). Notice of Funds Availability (NOFA) Invitation for Applications for the Value-Added Agricultural Product Marketing Development Grant Program (VADG). *Federal Register, 66(44),* 13487 - 13490. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2002, June 24). Notice of Funds Availability (NOFA) Inviting Application for the Value-Added Agricultural Product Market Development Grant Program (VADG). *Federal Register*, 42531 - 42538. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2003, September 4). Notice of Funds Availability (NOFA) Inviting Applications for the Value-Added Agricultural Product Market Development Grant Program (VADG). *Federal Register*, 52565 - 52572. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2004, June 15). Announcement of Value-Added Producer Grant Application Deadlines and Funding Levels. *Federal Register*, 33348 - 33360. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2005a, March 7). Announcement of Value-Added Producer Grant Application Deadlines and Funding Levels. *Federal Register*, 10938 - 10951. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2005b, December 21). Announcement of Value-Added Producer Grant Application Deadlines. *Federal Register*, 75780 - 75790. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2008, January 29). Announcement of Value-Added Producer Grant Application Deadlines. *Federal Register*, 5157 - 5167. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2009a, May 6). Announcement of Value-Added Producer Grant Application Deadlines. *Federal Register*, 20900 - 20911. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2009b, October 5). Inviting Applications for Value-Added Producer Grants. *Federal Register*, 51126. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2013, November 25). Inviting Applications for Value-Added Producer Grants. *Federal Register*, 70260 - 70267. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2015, May 8). Inviting Applications for Value-Added Producer Grants. *Federal Register, 80(89),* 26528 - 26534. U.S. Department of Agriculture.

Rural Business-Cooperative Service. (2016, April 1). Inviting Applications for Value-Added Producer Grants. *Federal Register*, 20607 - 20614. U.S. Department of Agriculture.

Rural Business-Cooperative Sevice. (2007, April 16). Announcement of Value-Added Producer Grant Application Deadlines. *Federal Register*, 18949 - 18959. U.S. Department of Agriculture.

Schenheit, N. T. (2013). An Analysis of the U.S. Department of Agriculture's Value Added Producer Grant Program, 2002 to 2012. *MS Thesis Paper*. University of Minnesota.

Stearns, T. M., Carter, N. M., Reynolds, P. D., & Williams, M. L. (1995). New Firm Survival: Industry, Strategy, and Location. *Journal of Business Venturing, 10*(1), 23 - 42.

U.S. Department of Agriculture Rural Business-Cooperative Service. (2015). Final Rule, 7 CFR Part 4284. *Federal Register, Value-Added Producer Grant Program, 80, 89*.

U.S. Department of Agriculture Rural Development. (2006, July). Executive Summary. *2007 Farm Bill Theme Papers*. U.S. Department of Agriculture.

U.S. Department of Agriculture Rural Development. (n.d.). *Mission & History*. Retrieved from United State Departement of Agriculture Rural Development: http://www.rd.usda.gov/about-rd/mission-history

Utterback, J., & Abernathy, W. (1975). A Dynamic Model of Process and Product Innovation. *OMEGA 3, 3*(6), 639 - 656.

Van Auken, H., & Carraher, S. (2012). An Analysis of Funding Decisions for Niche Agricultural Products. *Journal of Developmental Entrepreneurship, 17*(2).

Vaupel, J., Manton, K., & Stallard, E. (1979). The Impact of Heterogeneity in Individual Frailty on the Dynamics of Mortality. *Demography, 16*(3), 439 - 454.

W.K. Kellogg Foundation & Corporation for Enterprise Development. (2003). Mapping rural entrepreneurship. Battle Creek, MI: W.K. Kellogg Foundation & Corporation for Enterprise Development.

Walls & Associates. (2011). *National Establishment Time-Series (NETS) Database: 2011 Database Description.* Oakland, CA.

Wheelock, D. C., & Wilson, P. W. (2000). Why do Banks Disappear? The Determinants of U.S. Bank Failures and Acquisitions. *The Review of Economics and Statistics, 82*(1), 127-138.

Wiklund, J., & Shepherd, D. (2003). Knowledge-based Resources, Entrepreneurial Orientation, and the Performance of Small and Medium-sized Businesses. *Strategic Management Journal, 24*(13), 1307 - 1314.

Womach, J. (2005). Agriculture: A Glossary of Terms, Programs, and Laws, 2005 Edition. Washington, D.C.: Congressional Research Services, Library of Congress.

Woods, T., Velandia, M., Holcomb, R., Dunning, R., & Bendfeldt, E. (2013). Local Food Systems Markets and Supply Chains. *Choices*.

Young, R. W. (2006). *Audit Report: Rural Business-Cooperative Service Value-Added Agricultural Product Market Development Grant Program.* U.S. Department of Agriculture. Office of Inspector General, Great Plains Region.

Yu, L., Orazem, P. F., & Jolly, R. (2009). Why do Rural Firms Live Longer? *American Journal of Agricultural Economics, 93*(3), 673 - 692.