Overcoming Selection Bias in Measuring the Effect of Entrepreneurial Assistance Programs

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INTRODUCTION

Entrepreneurship is a primary driver of economic growth in a society (Knight, 1921; Schumpeter, 1934). One study suggests that nearly 70 percent of US economic growth can be attributed to entrepreneurial activity (Reynolds et al, 2000). Research has also consistently shown that over 50% of new ventures fail within the first five years (Cooper, Woo and Dunkelburg, 1988; Shane, 2008). Therefore, given that new venture creation is both valuable to society but difficult to achieve, it is not surprising that a significant amount of public dollars have been allocated to create programs to assist entrepreneurs. These organizations are known broadly as Entrepreneurial Assistance Programs (EAPs).

The primary goal of most EAPs is to aid prospective small business owners in new venture creation by providing pre-venture assistance (Chrisman, Hoy, Robinson, 1987). While prior research seems to indicate that EAPs such as the Small Business Development Center (SBDC) can positively impact the formation of new ventures (e.g Clark et al., 1984; Stevenson and Sahlman, 1988; Solomon and Weaver, 1983; Robinson, 1982), these programs are costly, as the initial Small Business Development Act of 1980 authorized an annual funding level of $20 million dollars. This number has since grown to fund the roughly 1,000 full time service centers that operate with an overall budget of roughly $200 million dollars (ASBDC, n.d.). Evaluation of the effectiveness of EAPs and EAP practices is therefore of non-trivial importance (Yusuf, 2010).

One such EAP is The Michigan State University Product Center for Agriculture and Natural Resources (or The Product Center for short). The Product Center was created by a memorandum of understanding among the MSU College of Agriculture and Natural Resources

(CANR), Michigan State University Extension (MSUE), and the Michigan Agricultural Experiment Station (MAES) on March 1, 2003 and is still in operation as of today (2012). The original mission was, “To be a catalyst for the creation of profitable futures for businesses and industries engaged in Michigan’s agriculture, food and natural resources systems.” This was then expanded into a three part framework that emphasized the Product Center’s role as a business and technical assistance program, a market research institution and an entrepreneurial education provider (from MSU Product Center Strategic Plan, 2007). However, over time, it became clear that the entrepreneurial education component was not highly valued by the entrepreneurs themselves, and this component was dropped in order to focus more heavily on the other two.

The Product Center’s team consists of a core group of self-directed staff members involved in all or most of the organization’s processes, a small executive group comprised of the Product Center director and the two associate directors, who take actions and make commitments on behalf of the organization, and two operating subgroups: a research subgroup–composed of university faculty and students who engage in interdisciplinary research aimed at identifying and supporting actual and potential clients’ needs; and a venture development subgroup–who work with the actual and potential business clients, as well as the internal and external partners, to provide the analysis and services the clients require. In addition, the Product Center has a vast network of affiliates who support the organization in its operations and an information cadre of persons, including previous clients, partners and stakeholders, who have a strong interest in the operations but are not currently actively involved.

The Product Center’s central offices are housed on the campus of Michigan State University, but its innovation counselor network is dispersed throughout the entire state of Michigan, operating through MSU’s extension network. This structure allows clients to have

their first contact with an innovation counselor in their local extension offices, with more advanced services offered on campus.

The Product Center operates on two levels: an innovation counselor network that operates through MSU's extension network throughout the state of Michigan and an on-campus specialized service unit. At the extension level, selected extension agents are trained to be "Innovation Counselors" who serve as a first contact for individuals interested in receiving services from the Product Center. The on-campus specialized service unit assists entrepreneurs by either directly providing services to clients or connecting them to on-campus departments. The services provided are: packaging, nutritional labeling, assistance in obtaining financing, feasibility studies, food-safety testing, assistance in supply-chain entry, product testing, strategic advice and legal assistance.

The basic process which the Product Center follows is as follows: Innovation Counselors will first engage in counseling sessions with clients to determine feasibility of their business idea and its implementation and begin the Product Center process. From this session, the counselor will use his or her own knowledge and training to help clients develop their idea into a more defined venture concept. After the venture concept is developed, the Product Center will classify the new venture to be in the "start-up" phase prior to launch and counselors either help the clients directly or refer them to the on-campus specialized service unit to assist with business planning. This business planning will involve detailing the entrepreneur's strategic and operational goals and plans for achieving them, as well as assistance in creating a formal business plan and testing its market feasibility. As the venture concept is further developed counselors may also refer clients to the on-campus specialized service unit or to the network of partners the Product Center has developed in order to assist in filling resource-gaps that an

entrepreneur may have in developing their product for launch. Finally, once the a sound business plan is in place and the product has been sufficiently developed, the Product Center assists entrepreneurs in the launch of their new venture through finding and identifying scale-appropriate opportunities to pursue.

Since it began operations in 2004 the Product Center's staff has had over 15,805 one-on-one client sessions, helped 1,434 clients with developing their venture concept, has gotten 881 clients to the start-up stage and helped to produce 164 launches. In addition the Product Center has also provided over 917 clients with different specialized service assistance (see table 1 below).

Table 1: Summary of the services provided by the MSU Product Center

SERVICES PROVIDED	SINCE 2004	In 2010
One-on-one client counseling sessions	*15,805 sessions*	*3,672 sessions*
Assistance with business concept development	*1,434 clients*	*318 clients*
Venture start-ups	*881 clients*	*160 clients*
Specialized services	*917 clients*	*204 clients*
Venture launches	*164 ventures*	*19 ventures*

Given that the Product Center, though still a relatively young EAP, has now had many years' worth of experience with hundreds of clients, it is deemed to be a suitable unit of analysis. In 2011, a qualitative case-study analysis was completed on "*How do EAPs create value for their clients?"* The data used for this analysis was collected over multiple years through a combination of surveys and in-depth interviews with Product Center clients, counselors and core staff members (see figure 1 below). In short, the case study found that EAPs can create value for its clients through increasing the probability of new venture success and survival through: providing a check on cognitive biases in decision making; assisting in strategic planning and the

development of a proprietary competitive advantage; providing services that help to legitimize the client's new venture; serving as an indirect tie to resource holders and trading partners; and identifying and creating opportunities for its clients. Other authors have found similar results indicating that the value created by EAPs can be broadly categorized into either providing information and knowledge that can benefit the formulation of new venture strategy (e.g. Chrisman and McMullan, 2005) or can provide a valuable signal or "badge" to help entrepreneurs overcome the liability of newness associated with new ventures (e.g. Rotgers et al, 2012; Stinchcombe, 1965).

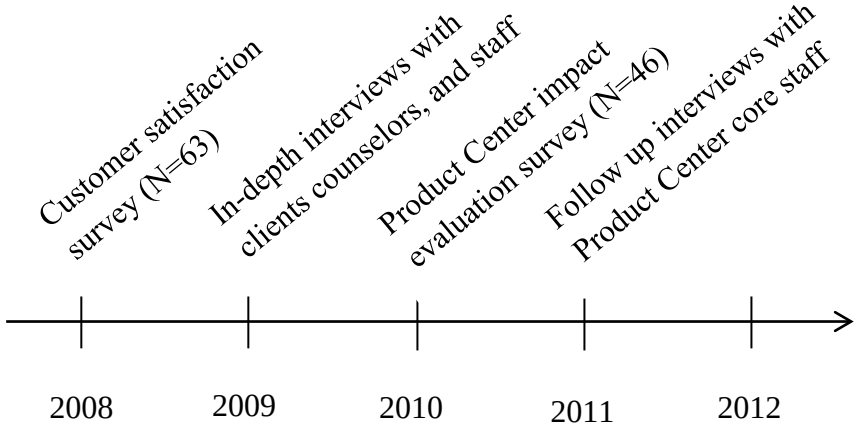

Figure 1: Previous Data collection timeline

While the information gleaned from the two surveys and in-depth interviews provided substantial insights into the demographics and satisfaction levels of the Product Center's clientele (see appendix table A1- A6), the economic impact analysis of the EAP assistance offered mixed results and suffered from small sample sizes.

Using the theoretical foundation that was built to answer the question of "How do EAPs create value for entrepreneurs," the next step will be to evaluate "how much" value is created by quantitatively testing each of the research propositions with an appropriate statistical model. However, to do so will require developing appropriate techniques to overcome the inherent selection bias in this evaluation.

BACKGROUND

In the early 1980s to the mid-1990s there was a prominent strand of research that measured the impact of EAPs in terms of comparing EAP clients to non-EAP clients on performance measures such as increase in sales, employments and profits (Robinson, 1982; Chrisman, Nelson, Hoy and Robinson 1983; and Chrisman, Hoy and Robinson 1987). In general, these studies found that EAP-clients outperformed their non-EAP counterparts. However, these studies often compared the performance of a small number of EAP clients (usually under 100) from high performing EAPs to state averages of entrepreneurship (e.g. Chrisman, Hoy and Robinson 1987). In addition, there does not appear to be any accounting for the selection bias from these early studies that is inherent in the EAP process.

In addition to performance measurement comparisons there have been other studies aimed at the subjective assessment of client satisfaction as a measure of the benefit of an EAP (Ibrahim and Goodwin, 1986; Solomon, 1983; Nahavandi 1988). These studies have found that EAP clients have, on average, rated EAPs positively. However, one study found no correlation between client satisfaction levels and the previously indicated performance indicators (McMullan, Chrisman and Vesper, 2001). Instead, they concluded satisfaction came more from the personal experience the client had with the counselor. More recently, Yusuf (2010) assessed

EAPs based on client participation, satisfaction and entrepreneurs' subjective assessments of overall effectiveness. In regard to the last measure, Yusuf found that EAP programs were effective at meeting the nascent entrepreneur's support need only 25.8% of the time. However, despite this lack of effectiveness, Yusuf still found that 96% of the surveyed clients found the assistance at least somewhat valuable, with 50% finding it extremely valuable (Yusuf, 2010). This high degree of satisfaction, yet unclear correlation to how the assistance actually improves the business also suggests deeper analytical research is required in order to uncover the mechanisms of EAP impact on the success and survival of its clients' new ventures.

One theory proposed by Chrisman and McMullan (2000; 2005) on the mechanism by which EAPs can help improve clients' new venture survival and success is that assistance from outside advisors facilitates the development of knowledge, as a special type of resource available to the firm. They argue that the knowledge possessed by the entrepreneur or entrepreneurial team creates the foundation for many if not all of the new venture's competitive advantages (Alvarez and Busenitz, 2001; Chrisman et al., 1998, c.f. Chrisman and McMullan, 2005). Given that individual entrepreneurs have imperfect knowledge of market conditions (Hayek, 1945) and may not know how to write business plan, obtain financing, optimally locate their business or deal with trading partners, EAPs can help improve new venture success by providing the tacit and explicit knowledge needed to fill those gaps (Chrisman and McMullan, 2005).

In addition, individuals facing uncertainty have certain heuristics and biases that also influence their decision-making processes (Busenitz & Barney, 1997). More importantly, these heuristics and biases vary across individuals and will have a significant impact on who decides to become an entrepreneur and the probability of success of the venture (Venkatraman, 1997). This variation is useful in determining not only why some individuals become entrepreneurs when

others don't, but also in evaluating why some ventures fail and others do not. Specifically, though certain biases and heuristics will increase the likelihood of deciding to exploit a perceived entrepreneurial opportunity, it can also negatively impact the probability of success of that entrepreneurial opportunity if the entrepreneur does not full appreciating the costs or risks involve and take appropriate measures to deal with them (Baron, 2004). Therefore, the more that the entrepreneur can build and engage "safety nets" that provide checks on whether a cognitive bias is leading them down a potentially negative path, the more successful they will be at exploiting an entrepreneurial opportunity (Simon et al, 2000). By leveraging an EAP counselor's tacit strategic knowledge into the entrepreneur's information set in developing the entrepreneur's new venture strategy, entrepreneurs can thereby make better decisions as to whether or not to exploit a particular opportunity and how to do so. This will lead to a "weeding out" of bad ideas, which is beneficial in light of the opportunity cost of wasting resources on untenable ideas, as well as the "planting in" of good ideas that otherwise may not have been exploited. In this way, EAPS can provide a check on whatever cognitive biases an entrepreneur may have in order to help them make better decisions.

The ability of an EAP to help develop an entrepreneur's knowledge resource base led Chrisman and McMullan (2005) to predict and find support for the hypothesis that new venture performance would increase in direct proportional to amount of counseling received. However, they also predicted and found support for the notion that this relationship would not be linear in nature but rather curvilinear with decreasing returns to scale. The logic behind this argument being that somewhere in the learning process most of the information about the venture and industry that is readily available will have been obtained and additional knowledge accumulation will require more effort and time as an entrepreneur reaches the point where uncertainties can

longer be reduced (Bhide, 2000; c.f. Chrisman and McMullan, 2005). At some point an entrepreneur must "take the plunge" based on the information set she has and too much preparation only leas to what Peters and Waterman (1982) term a "paralysis of analysis" (Chrisman and McMullan, 20005).

Another mechanism by which EAPs can create value for their clients that was found in the author's master's thesis as well as a recent article by Rotger, Gortz and Storey (2012), is the signal or "badge"(Bell et al., 2002) that completing a business plan with EAP assistance can provide. As shown by Shane(2003), business plans, or documents that present the entrepreneur's conjectures in written and visual form, are important tools in overcoming many of the uncertainty and information asymmetry issues in the resource acquisition process (Shane, 2003). Business plans allow entrepreneurs to tell their stories in an institutional way (Zimmerman and Zeitz, 2002), and thereby provide an appropriate platform to reduce the level of information asymmetry to investors.

Business plans also provide a signal of the quality of the entrepreneur and opportunity to investors, which can help overcome adverse selection and moral hazard issues (Shane, 2003). Shane (ibid.) has shown that business plans can provide legitimacy when external validation of the opportunity is difficult (Aldrich, 1999), rationalize the opportunity that is easy for others to accept (Lounsbury and Glynn, 2001), generate confidence (Fisher, 1985) and by convincing resource providers that the opportunity is a reality, making it more likely that the entrepreneur can get the resources necessary to actually make it a reality (Gartner et al., 1992). However, because business plans are created by entrepreneurs they may tend to be overly optimistic and cause resource holders to wish for additional forms of validation (De Meza and Southey, 1996; Busenitz and Barney, 1997).

Finally, in order to find theoretical support on the proper methods to utilize to answer the above research questions, previous research articles were reviewed on the basis of: sample populations used, indicators of EAP impact, hypotheses tested, methodologies, control variables and findings. To this extent, some work has already been done (see Kosters and Obschonka, 2010) comparing past research on the basis of indicator variables, control variables, methodology and findings. However, Kosters and Obsochonka's literature review was aimed at analyzing the progression of EAP analysis on if and how different authors controlled for selection bias, but did not address the other measurement concerns listed above in table 2. The author was unable to find any articles directly dealing with this issue either.

In general the previous studies reviewed (see table 3 below, adapted from Kosters and Obschonka, 2010) have focused on measuring the impact from assistance through an analysis of clients' subjective assessments of the assistance provided (57% of studies reviewed), increase in sales or earnings (57%), employment growth (50%) and venture creature and/or survival (36%). These analyses were first conducted as a comparison of means of the subjective assessments, or comparison of means of the treatment group of assisted entrepreneurs versus a control population (e.g. Chrisman, 1989; Chrisman & Lee, 1989; Chrisman, 1999; Chrisman & McMullan, 2000). These initial analyses all found that assistance created a positive impact on all four measures of performance listed above.

Table 3: Comparison of EAP impact studies (adapted from Kosters and Obschonka, 2010)

Author(s) and Year of Study	Performance Measures Used				Econometric, Mean Comparison or Monitoring Analysis	Control for Selection Bias?	Positive Impact on Venture Performance?
	Subjective assessment of perceived usefulness	Employment Growth	Sales or Earnings Growth	Venture creation and/or Survival			
Rotger et al (2012)		x	x	x	Econometric	Yes - Propensity Score Matching	Yes - All Measures
Yusuf (2010)	x				Econometric	No	No - For meeting perceived needs of Venture
Kosters and Obschonka (2010)	x	x			Econometric	Yes - Propensity Score Matching	No - Economic Performance; Yes - Perceived Usefulness
Mole et al. (2008)		x	x		Econometric	No	Yes - Employment; No - Sales
Stubner et al. (2007)	x		x		Econometric	No	Yes - Earnings and Subjective measures
Parker & Belghitar (2006)				x	Econometric	Partially	No
Chrisman et al. (2005)		x	x		Econometric	No	Yes - Sales and Employment
Kulicke(2004)	x				Monitoring	No	Yes
Wren & Storey (2002)		x	x	x	Econometric	Yes - two step estimation	Yes - Sales, Employment and survival for Medium sized companies, No - Small companies
Chrisman & McMullan (2000)	x	x	x	x	Mean Comparison	No	Yes for all
Chrisman (1999)		x	x	x	Mean Comparison	No	Yes - Likelihood to launch venture
Barney et al (1996)	x				Econometric	No	Yes, for ventures with less experience
Chrisman & Lee (1989)	x		x		Mean Comparison	No	Yes -In Short Run
Chrisman (1989)	x				Monitoring	No	Yes - Strategic Assistance; No - Operating or Administrative
Percentage	**57%**	**50%**	**57%**	**36%**		**21%**	**79%**

However, it became evident that a simple comparison of means of assistance entrepreneurs to a general population of entrepreneurs was not providing a sufficient

counterfactual to the treatment group due to the concerns over selection bias (e.g. Wren & Storey, 2002) that have been discussed above, and that more sophisticated econometric methods were needed to account for this. Some authors have attempted to overcome this problem by focusing on the incremental benefit provided by various levels of assistance within the assisted population (e.g. Chrisman et al., 2005), while others have turned to econometric techniques such as a Heckman-Lee two-step estimation (Heckman, 1979; Wren & Storey, 2002) or Propensity Score Matching (Heckman, 2005; Rotgers et al, 2012; Kosters and Obschonka, 2010). In such cases where the selection bias has been controlled for, the evidence that EAPs create positive impacts is much less clear, with some finding no impact (Kosters and Obschonka, 2010), some finding mixed results (Wren and Storey, 2002) and some still finding positive impacts (Chrisman et al., 2005; Rotgers et al., 2012). Interestingly, none of these studies explicitly dealt with the survivor bias issue nor the difference between lifestyle and innovative entrepreneurs, though both the more recent studies (Kosters and Obschonka, 2010; Rotgers et al.,) dealt with the clustering of intensity of use.

There also does not be clear evidence that the most favored current technique for dealing with selection bias, Propensity Score Matching, truly provides a consistent estimate of the treatment effect. This technique uses a probit or logit regression to predict the likelihood to seek assistance based on a large number of observable characteristics and then compares the means of the performance variables of assisted entrepreneurs to those of non-assisted entrepreneurs who have relatively close “propensity scores” (i.e. predicted probability of seeking assistance from the estimated coefficients of the logit regression) (Heckman, 2004). While this might adequately control for the selection bias effect, it appears to do so at the cost of controlling for all the other factors that might affect performance that have not entered into the propensity score equation.

Surprisingly, one of the most straightforward methods of addressing this issue, namely conducting an Instrumental Variable (IV) regression, has not been attempted in any of the reviewed EAP studies below. This approach, relies on finding an instrument {P} for the endogenous treatment variable {Z} such that cov (P, ε) = 0 and cov (Z,P) ≠ 0 in order to identify the exogenous element of {Z} such that a consistent estimate of α in equation (1) can be determined. While finding an appropriate instrument can often be difficult, it is unclear why this approach has never been attempted.

Furthermore, {Z} is only endogenous if it is correlated with the uncontrolled elements of performance {ε}. As discussed above, given the selection and survivor biases inherent in the analysis of any sample population this seems a likely assumption. However, given that the causes of selection and survivor bias appear to be well-known, if these can be modeled directly in the control vector {X} then the resulting {ε} will not be correlated with {Z} and endogeneity will not be a concern. The reviewed past studies have assumed such direct modeling of the cause of selection and survivor bias to not be possible as the causes themselves occur from unobservable characteristics such as the aforementioned propensity to seek information, entrepreneurial ability, quality of the venture concept, work ethic and so on. However, it may be possible to model such latent variables using a structural equation modeling (SEM) approach if clear identifiable manifest (observable) variables can be ascertained that are predicted by the latent variables. In this way, then these concerns can be dealt with directly in an SEM model estimated through maximum likelihood estimation (MLE) and the treatment effect of Z tested via t-test (Kaplan, 2009). Again, current review of the EAP literature has not provided any evidence that this method has been attempted either. Therefore, this dissertation will utilize all of these methods in an attempt to answer the stated research questions as will be described below.

Research Question

This rest of this paper will now examine how to answer the following research question:

How much value has the Product Center, as an example EAP, created for its clients? (1)

This will be done through developing a quantitative regression analysis that will provide a numerical output in terms of how much the EAP's assistance can be said to increase gross annual sales, employment, ability to obtain financing and survival rates of their clients when compared to a control group. The working hypothesis in relation to this research question is:

H_1: Entrepreneurs who receive assistance from an EAP will be more likely to have higher performance, survival rates and legitimacy than had they not sought assistance.

This claim will be tested against the null hypothesis:

H_{1o}: Receiving assistance from an EAP will have no effect on entrepreneurial performance, survival rates and/or legitimacy.

However, as will be discussed below, one cannot simply compare such performance rates of EAP clients versus non-EAP clients and consider the question adequately answered. As can be seen by the formulation of H_1 the claim is the EAPs increase performance and survival rates in relation to what would have otherwise occurred for each individual entrepreneur, not versus an entrepreneur who did not seek assistance[1]. This is an important distinction because there are numerous measurement concerns such as selection bias, survivor bias and clustering effects involved with who seeks assistance that also impact entrepreneurial performance. Therefore, in order to answer (1), we must first answer research questions (2) and (3) stated below:

What types of entrepreneurs seek assistance and why? (2)

[1] Unfortunately this cannot be directly observed because we cannot see what would have happened had the entrepreneur not sought assistance. This dilemma lies at the heart of the measurement concerns to be discussed.

What types of entrepreneurs drop out from assistance and why? (3)

Determining the answer to research question (2) will be shown to be essential in overcoming the inherent selection bias involved with entrepreneurs who seek assistance. On the one hand, some have suggested that the fact that an entrepreneur has sought assistance indicates the entrepreneur is likely having some problems with the launch of their new venture (e.g. Kosters and Obschonka, 2010). These problems could be due to a lack of business experience or entrepreneurial ability that in turn will affect the overall performance of the new venture. Therefore, any comparison of assisted entrepreneurs to non-assisted ones would have an inherent negative bias in its estimation if this sample-selection is not accounted for. On the other hand, the propensity to seek as much information as possible before making important strategic business decisions, as opposed to relying on cognitive biases and heuristics, has also been shown to increase the overall probability of success for a new venture (e.g. Baron, 2004). Given that entrepreneurs often come to EAPs to seek information, thus potentially signaling a higher propensity to seek information than those who do not come to an EAP, some researchers have suggested that this will cause an upward bias on estimators that compare EAP clients to a control population that has not sought assistance (e.g. Rotgers et al, 2012).

In essence if one were to conduct a simple regression such as:

$$Y_i = X_i\beta + Z_i\gamma + \epsilon_i$$

Where Y denoted a particular performance variable, X was a vector of explanatory control variables and Z was a dummy variable indicating participation in an EAP with a corresponding β γ vector of coefficients to be estimated, then the biases mentioned above would result if some unobserved variables, such as entrepreneurial ability or the propensity to seek information, influences the participation variable, as well as the elements of performance not directly

controlled for (i.e. the error term). Then the estimator of interest, γ, would be correlated with the error term (which would include the omitted variable) and hence lead to inconsistent estimation (Wooldridge, 2002).

This concern is particularly problematic because, given that the two causes of selection bias act in opposite directions, not only is the magnitude of the bias uncertain but so too is the sign. Still, if one can sufficiently predict participation in an EAP based on both of these two factors, then different econometric techniques can be used to correct for this in final analysis of EAP impact on venture performance. Therefore, in relation to research question (2), two hypotheses can be formed that will ultimately help us answer research question (1):

H_{2a}: Entrepreneurs with less entrepreneurial experience and/or ability will be more likely to seek assistance than those with more experience and/or ability.

H_{2b}: Entrepreneurs with a higher propensity to seek information will be more likely to seek assistance than those with a lower propensity to seek information

These hypotheses, in turn, will be tested against the null hypothesis:

H_{2o}: There is no difference between entrepreneurs who seek assistance and those who do not.

In addition to these selection bias concerns, there is also a concern that comparing EAP clients to non-EAP clients will also have some degree of survivor bias. Therefore, answering research question (3) will be of prime importance in overcoming this issue. This is because the literature has also suggested that entrepreneurs who are less committed, have untenable ideas, or have a variety of other issues that would impede their overall chance of success, tend to get "weeded out" in the first stage of the counseling process when counselors educate clients on the work involved and low probabilities of success (Storey, 2000; McMullan, Chrisman and Vesper, 2001). It is logical to suggest had the "weeded-out" group continued on to launch their new venture, their overall probability of success would be lower than the general population of

entrepreneurs. Conversely, the population that does continue on through the process is one that can be expected to have a higher probability of success, based on the quality of their idea or their willingness to put forth the appropriate effort, than the general entrepreneur population and hence would cause a positive duration or survivor bias on any estimations of the impact of assistance.

On the other hand, though the literature has not dealt specifically with this issue, the author's prior research work suggests that many experienced or skilled entrepreneurs do not find the assistance all that beneficial. This might indicate that the counseling and services provided are a substitute, rather than a complement, to the entrepreneur's own knowledge and skill set. In this case, the entrepreneurs who drop out from assistance, but still go on to launch their new venture, will be likely to have higher performance and survival rates than those who persist in the process due to the higher degree of entrepreneurial skill and ability the ones who drop out possess. Therefore, similar to the concern of selection bias, we are unsure *a priori* whether the survivor bias will be positive or negative in effect or what the magnitude of the bias will be.

However, empirically this can dealt with in a similar manner to dealing with selection bias, if one can provide an adequate answer to research question (3). Accordingly the following hypotheses are proposed to answer research question (3):

H_{3a}: Entrepreneurs who seek assistance and then drop out will be more likely to have a lower work ethic, commitment or viable business idea than those who persist in the process.

H_{3b}: Entrepreneurs with higher levels of entrepreneurial experience and ability who seek assistance and then drop out will be more likely have higher performance and survival rates than those who persist in the process.

These hypotheses will be each be separately tested against their null:

H_{3o}: There is no significant difference between entrepreneurs who seek assistance and then drop out versus those who seek assistance and persist in the process.

Methods for Overcoming Selection Bias

It should now be clear that answering the "Who seeks assistance?" and "Who drops out from assistance?" will be essential for overcoming the selection bias in order to answer the "How much value is created?" question. If we start by examining the "Who seeks assistance?" question then we can postulate there exists a latent factor Y*, which represents the value an entrepreneur perceives he or she will obtain from assistance, that will determine whether or not that entrepreneur decides to seek assistance such that if $Y^* > 0$ an entrepreneur will seek assistance and if $Y_i^* \leq 0$, the entrepreneur will not seek assistance. Furthermore, let us assume that Y_i^* is influenced both by observable characteristics represented by a vector $\{X_i\}$ such as management experience, education, age, distance from EAP office, etc.., and unobservable characteristics represented by an error term $\{\varepsilon_i\}$ such as entrepreneurial ability, propensity to seek information, work ethic, etc.., unique to each (i) entrepreneur in our sample of N respondents. Then we can characterize the decision to seek assistance by equation (1):

$$Y_i^* = X_i\beta + \varepsilon_i \ (i = 1,2 \dots, N) \qquad (1)$$

However, as Y_i^* is a latent variable we only observe its sign indicated by the participation dummy variable $\{Z_i\}$ where $Z_i = 1$ (indicating participation in an EAP) if $Y_i^* > 0$ and Z=0 (indicating no assistance received) if $Y_i^* \leq 0$. Despite this limitation, we can still rewrite equation (1) as follows:

$$For\ Z_i = \begin{cases} 1: X_i\beta + \varepsilon_i > 0 \\ 0: X_i\beta + \varepsilon_i \leq 0 \end{cases} \qquad (1a)$$

Then, using equation (1a), then we can see that the probability that an entrepreneur (i) seeks assistance (i.e. $Z_i = 1$) can be written as follows in equation (1b):

$$Prob(\varepsilon_i) > -X_i\beta \quad (1b)$$

Next, if we assume that the error term $\{\varepsilon_i\}$ follows an independently and identically distributed normal distribution with mean (0) and variance σ_ε^2, then the probability that ε_i is larger $-X_i\beta$ is simply $1 - \Phi(-X_i\beta)$ where Φ represents the normal cumulative density function (CDF). Furthermore, since the normal distribution is symmetrical in nature, $1 - \Phi(-X_i\beta)$ is equivalent to $\Phi(X_i\beta)$. Therefore, the probability that an entrepreneur seeks assistance, given the above assumptions, can be characterized by equation (1c):

$$Prob(Z_i = 1|X) = \Phi(X_i\beta) \quad (1c)$$

Given equation (1c) we can test hypothesis $\mathbf{H_{2a}}$ and $\mathbf{H_{2b}}$ using a probit regression model so long as we can find appropriate explanatory variables to proxy for entrepreneurs' "propensity to seek information" and "entrepreneurial ability" (Wooldridge, 2002).

In relation to the former, an experimental design is proposed wherein it will be determined if entrepreneurial orientation (EO), demographic and other psychological measures can be used to predict individuals propensity to seek information. This will be done through selecting a group of individuals, likely students first and entrepreneurs later, and asking them a series of EO, demographic and other psychological questions before conducting a simulated venture creation game. The game would function as follows: first, endow game players with initial investment level; second have players make a series of venture decisions (such as marketing outlet, initial scale, scope, etc..,) that each has a known cost and a predetermined, but unknown to the players, probability of success; next, after each decision is made, the outcome will be revealed by drawing from the predetermined random probability associated with each decision; after all decisions are completed, the player who has the highest net profits will be

declared winner and given some small monetary compensation. In addition, at each stage, players will be given an opportunity to bid some amount of their money, which if above a predetermined minimum threshold will be accepted, to be given the associated probability distributed for each decision. When players bid and how much they bid for this information will be used as the dependent variable proxy for propensity to seek information to be regressed on the EO and other questions in order to determine how these psychological and demographic characteristics predict propensity to seek information, which can then be used to conduct a confirmatory factor analysis to be tested in equation (4) via structural equation modeling.

In relation to the $\mathbf{H_{2b}}$ which postulates that those with lower entrepreneurial ability will also seek assistance, this will be proxied through conducting a confirmatory factor analysis on the following variables: previous ownership of a firm, management experience, and education; and will be tested for significance in equation (4) via structural equation modeling as well.

As discussed above, in addition to the aforementioned selection bias effect, there is also a concern regarding a survivor bias with entrepreneurs who persist through the Product Center's process and the subsequently respond to the survey questionnaire. The concern over this bias is, similar to the selection bias, two-fold in nature with opposing effects thus making the sign and magnitude of the bias uncertain. The reasoning behind this concern is as follows: given that the counseling process might discourage entrepreneurs with less tenable ideas, commitment to the entrepreneurial process and/or work ethic, those that do persist might be expected to have an upward bias on their performance that would be unrelated to the assistance provided by the Product Center. However, given that the information provided by the Product Center often involves fundamental business strategy in the form of explicit business knowledge and the tacit knowledge of the counselors, those entrepreneurs with a high-level of business knowledge

themselves (which the resource-based theory of the firm would predict would correlate with higher venture performance) might not find the process useful and drop-out, thus creating a downward bias on the participation coefficient in an ordinary least squares regression.

Fortunately, both of these concerns can be addressed in a similar fashion to the selection bias issue, namely with IV-regression, Heckman two-step estimation and propensity score matching, but will require a separate sample population to run the probit model predicting persistence in the Product Center. This model can be characterized exactly the same as in equation (1c) except that instead of comparing Product Center clients to a general population of entrepreneurs, this model will need to compare Product Center clients who persisted in the Product Center process to those that dropped out at some stage. This may prove difficult in practice, however, as past survey attempts have had little to no response from those who have dropped out. However, if a sufficient sample size can be reached, a probit regression can be conducted with a new dummy variable $\{Z_i'\}$ such that $Z_i' = 1$ for those entrepreneurs who persist in the Product Center process through the launch of their new venture and $Z_i'=0$ for those entrepreneurs who drop out. For this analysis, given the same assumptions behind equation (1c), this model can be characterized be equation (1d):

$$Prob(Z_i' = 1|X) = \Phi(X_i\beta) \qquad (1d)$$

Hypotheses $\mathbf{H_{3a}}$ and $\mathbf{H_{3b}}$ can then be tested if appropriate measures can be developed to proxy for the quality of the idea[2] work ethic and commitment to the entrepreneurial process, whereas entrepreneurial ability can be tested the same ways as in equation (1c).

[2] Not sure the practical feasibility of *a priori* determining quality of the idea via survey

This can also provide an answer to a question that is currently left unaddressed in the literature, namely "Is counseling a substitute rather than a complement for other sources of knowledge?" through the testing of **H_{3b}**. Furthermore, through the identification of the types of entrepreneurs who persist through the process, empirical support can be given to the value of the signal completing the Product Center process provides. That is to say, if those who persist perform better, on average, than the general population of similar entrepreneurs, then completing the Product Center's process does indeed provide a useful signal to investors and trading partners in order to form relationships with the Product Center's clients.

Finally, if significant results can be obtained for both models (1c) and (1d), the remaining question is whether or not a third model can be ascertained that predicts *both* participation and persistence, which can be modeled as an interaction dummy between $\{Z\}$ and $\{Z'\}$ represented as $\{Z''\}$. This model would need to include both sets of explanatory variables in equations (1c) and (1d) and can be written as follows in equation (1e):

$$Prob(Z_i'' = 1|X) = \Phi(X_i\beta) \qquad (1e)$$

If such a model can be ascertained then, as will be explained below, it can be used to control for both selection and survivor bias in the estimation of the treatment effect of participation. To date, there have been no studies to directly achieve this and doing so will provide both a methodological and empirical contribution to the literature.

APPENDIX

Table A1: Demographics or Respondents to the 2007 Product Center Client survey

2007 Survey of Product Center Clients – Demographics of Respondents (N=63)		
Category	**Mean**	**Std. Dev**
Age	50.6	10.0
Education (years)*	14.8	2.2
Income*	$72,016	$37,278
Time spent on idea	3.5 years	0.8
# of Employees in Venture	1.6	3.2
Gross Annual Sales of Venture	$118,302 (Median = $22,500)	$335,658
Management Experience	3.4 years	2.252369
Head of Household	64%	
Launched Venture at time of survey	50%	
Prior Business Owner	57%	

*Categorical response, so means and standard deviations estimated based on mean of category.

Table A2: Industry of respondents to the 2007 Product Center Client Survey

2007 Survey of Product Center Clients – Industry of Respondents (N=63)	
Food (production, processing and marketing)	67.2%
Natural resources and agri-tourism	10.9%
Beverage	6.3%
Ornamental Plants	6.3%
Energy/biomass	4.7%
Agri-based commercial and industrial goods	4.7%
Professional business services	4.7%
Pets and service animals	1.6%

Table A3: Services received from the Product Center of respondents of the 2007 Product Center client survey

2007 Survey of Product Center Clients – Services Received of Respondents (N=63)	
One-on-one counseling on the business venture	60.9%
Assistance in writing your business plan	35.9%
Business and market opportunity analysis	28.1%
Business planning	21.9%
Technical review of products by MSU experts	21.9%
Nutritional, product/sensory testing and/or packaging	20.3%
Participation in business tours (value-added visit, etc.)	18.8%
Marketing and promotional campaign development	17.2%
Legal Counseling	15.6%
Road to independence - Entrepreneurship education workshop	12.5%
Web site development	10.9%

Table A4: Summary of Product Center clients interviewed in-depth in 2009

2009 In-depth Interviews Summary of Product Center clients				
Business Description	**Age of Business**	**Business Experience**	**Services Received**	**Overall Satisfaction level with EAP**
Community Supported Agriculture (CSA) & U-pick Blueberries	2 years	Very little	Business Planning	Very Satisfied
Meat retailer and Dog Treat Producers	6 years	Extensive	Business planning course, assistance packaging	Dissastisfied – information was too generic
Turkey Processors	82 years	Extensive	Business planning assistance with USDA grant application, and direct financing	Very satisfied
Biodiesel Producer	6 years	Extensive – agronomy; Little - biodiesel	Business Planning and development of offering memo to raise funding	Mixed – EAP was helpful in critiquing plan, but had gaps in knowledge of

				industry
Vegetarian prepared food mixes	2 years	Very little	Nutritional analysis, packaging, labeling, marketing, and business planning	Very Satisfied
Agricultural Products Distributor	58 Years	Extensive	Business planning and market analysis	Mixed, but felt mostly information was better for smaller less experienced operations
Gluten-free cooking mixes	2 years	Little	Business planning, counseling, UPC code, marketing assistance, legal assistance	Satisfied with problem solving services, not as much with long-term planning
Specialty can-foods	81 years	Extensive	Business planning and creation of marketing outlets	Very Satisfied
Museum gift shop	10 years	Extensive – retail, food service Little - food processing	Business planning, pricing	Very Satisfied
Organic Lettuce Producer and Monarch Butterfly supplier for events	2 years	Extensive – organic farming	Business expansion, setting up of legal entity, creation of business plan	Mixed, very satisfied – lettuce business assistance, very dissatisfied - butterflies
Hygenic chew stick	Has not launched	Extensive – management	Business planning, packaging, marketing	Very Satisfied

Table A5: Demographics of respondents to the 2010 MI Food Processor Survey tabulated by whether they received assistance from an EAP or did not receive assistance (control)

2010 MI Food Processor Survey (n=46) Client Demographics tabulated EAP vs. Control			
	EAP client	Control	Total
Age (Std. Dev)	49.1 (10.4)	45.8 (13.1)	47.3 (11.9)
Gender (% Male)	48%	32%	39%
Education (years)	15.2	14.4	14.8
Average Household Income	$ 63,059.52	$ 53,560.00	$ 57,896.74
Head of Household	52%	44%	48%
Prior Business owner	43%	36%	39%
Average Management Experience (years)	10.8	3.9	7.0

Table A6: Business Demographics of respondents to the 2010 MI Food Processor Survey tabulated by whether they received assistance from an EAP or did not receive assistance (control)

2010 Food Processor Survey (n=46) Business Demographics tabulated EAP vs. Control			
	EAP client	Control	Total
Actively Advertising	52%	56%	54%
Selling more than one product	71%	56%	63%
Average age of business (years)	5.9	7.1	6.5
Expanded in past 5 years	57%	44%	50%
Wrote a business plan prior to launch	33%	48%	41%
Average Gross Annual Sales	$ 31,428.57	$ 46,400.00	$ 39,565.22
3-year average percentage change in gross annual sales	31%	9%	18%
3-year Average No. Employees (median)	8.5 (0.16)	15.9(2.66)	12.5(1.33)
Average Investment to launch business	$ 13,214.29	$ 18,809.52	$ 32,023.81

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