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Dependent Variables in Entrepreneurship Research

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Abstract

Phenomena relevant to the emergence of new economic activity or interruptions and changes to current economic activities, rather than contexts, are what constitute entrepreneurship. A re-emphasis on phenomenon-driven research will widen the context of entrepreneurship research, help delineate entrepreneurship as a domain, and provide greater emphasis on the selection and operationalisation of dependent variables. Entrepreneurship is a multi-level discipline, which provides some benefits as well as challenges. One benefit is the contribution to other fields within social science that results from research at various levels. A resulting challenge is dealing with heterogeneity that occurs at various levels. This paper discusses and offers illustrative examples each of these implications of phenomenon-driven entrepreneurship research.

Keywords: entrepreneurship, dependent variable, domain, heterogeneity, methods

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Introduction

Statistics texts dedicate much attention to the selection and proper use of the elements in the right hand side of theorised models—that is, to the collection of predictors and controls that we hope will explain variance in some other variable or set of variables (c.f. Stevens, 2002); however, it is the left hand side of the model—the dependent variable(s)—that we ultimately want to explain. Although thorough instruction and understanding regarding the proper selection and use of independent and control variables is important, an over-emphasis may result in researchers neglecting to give appropriate consideration to the dependent variable. The youth of entrepreneurship as an independent research domain, may exacerbate this problem. Before discussing dependent variables within the domain of entrepreneurship, along with issues related to those dependent variables, I briefly offer my assumptions about entrepreneurship as a domain.

Social science scholars, including those in entrepreneurship, recognise that “for a domain of social science to have usefulness, it must have a conceptual framework that explains and predicts a set of phenomena not explained or predicted by conceptual frameworks already in existence in other fields” (Shane & Venkataraman, 2000 p. 217). Although, I do not intend to dissect the various domain delineations offered by entrepreneurship scholars here, it is helpful—and only fair to readers—to state my assumptions about what the entrepreneurship research includes before discussing some of its dependent variables and related challenges.

What, then, does entrepreneurship explain that other fields do not explain? Entrepreneurship seeks to explain the emergence of new, including interruptions or changes to current, economic activities (Wiklund, Davidsson, Audretsch, & Karlsson, 2011). Baumol (1968) notes that neoclassical economics focuses on decisions aimed at optimizing production and social welfare based on *given* inputs; one such input is entrepreneurship. Furthermore, he states that neoclassical economists fail to offer an explanation as to where those inputs arise from; entrepreneurship, then, fills the gap by explaining the emergence of new economic activities, including interruptions or changes to current economic activities by offering explanations regarding an input (entrepreneurship) to economic change. Another way

of conceptualizing the contribution of entrepreneurship is Schumpeter's (1934) dis-equilibrating entrepreneur. Schumpeter contends that neo-classical economics explains how managers optimise production on the current productivity frontier and entrepreneurs, through innovations, push the frontier outwards (dis-equilibrating) which results in economic development.

Wiklund et al. (2011 p. 5) note that "the phenomenon of emergence of new economic activity lies at the heart of entrepreneurship." Before discussing the implications of this statement on dependent variables, it is worth noting the easily glossed-over magnitude of Wiklund et al's (2011) argument. These scholars are emphasizing the *phenomenon of emergence* as key to entrepreneurship, not because entrepreneurship scholars previously failed to recognise this somewhat obvious contention, rather because the field has drifted away from studying the phenomenon, instead focusing on its context. Specifically, they explain that: "the problem is that to a large extent, the entrepreneurship field has instead been unified by an interest in small, young, or owner-managed business, that is, *the context*, with far less cohesion and agreement concerning what it is about these small business and new firms that is so interesting (the phenomenon)." (Wiklund et al., 2011 p.5). A renewed focus on the phenomena that are interesting and unique to entrepreneurship research widens the context of entrepreneurship, helps delineate it from other domains, and illustrates the need for closer attention to the issues associated with dependent variable selection in entrepreneurship research (c.f. Wiklund et al, 2011).

The balance of the paper proceeds by listing implications of phenomenon-driven entrepreneurship research, why these implications arise, along with their relationship to the dependent variables of entrepreneurship research. In the section that covers the need for closer attention to the dependent variables, I focus specifically on the issues of levels of analysis and heterogeneity. Finally, I discuss conclusions and some limitations to this paper.

Widening the Context of Entrepreneurship

Admittedly, an attempt to draft a list of all of entrepreneurship's unique phenomena and related dependent variables would be unavoidably incomplete. Instead, I offer examples—in this section and in subsequent sections of the paper—of phenomena and related dependent variables which are relevant to entrepreneurship that are intended to be illustrative rather than quintessential; in this section, the examples are illustrative of why a focus on phenomenon-driven entrepreneurship research will result in a widened context.

As mentioned, many of entrepreneurship's unique phenomena are in line with the "emergence of new economic activity" (Wiklund et al, 2011 p. 5). Examples date back to classic entrepreneurship contributions such as Schumpeter's (1934) five types of innovations, which include the emergence of new: products, processes, business models, supply sources, and organisation of an industry perhaps through mergers or divestments. Although some of these innovations result from the efforts of small, new, and owner-managed firms, other types of firms also introduce new products, processes, business models, supply sources, and merge or divest industries. My goal is not to argue for or against studying small, new, and owner-managed firms; rather, my point is to emphasise that the size of the firm, for example, is not what is interesting and the thing that is interesting—for instance, a dependent variable such as innovation—can be studied under contexts that are largely ignored in entrepreneurship research. Dhliwayo (2014), for example, discusses entrepreneurship as a competitive strategy that involves continually developing and testing new products and services to sustain continual innovation. Interesting phenomena in entrepreneurship research are not limited to innovation; Castañós and Welsh (2013), for example, point out the crucial role that family therapists can play in the emergence of new economic activity as it relates to family businesses. Clearly, entrepreneurship research needs to move beyond only studying the context of small, new, and owner-managed firms alone if it is to more completely capture samples that are relevant to the phenomena associated with the emergence of new economic activity.

A primary reason to emphasise the use of other contexts—beyond the traditional sampling of new and small firms alone—in entrepreneurship research is achieving variance in our sampled-dependent variables more in line with the variance of the studied phenomena as it occurs in reality (Davidsson, 2004). As mentioned, statistical models often utilise independent and control variables in order to explain variance in a dependent variable. However, if what we operationalise as entrepreneurial outcomes include only those outcomes produced by small or new firms—which as discussed is not representative of all entrepreneurial phenomena—then, "we will end up with a dependent variable with limited and very erratic variance", confusing and weakening our results (Davidsson, 2004 p. 81).

Indeed, the list of dependent variables used in published entrepreneurship research is quite long (Ireland, Reutzel, & Webb, 2005). Two plausible reasons for the large array of dependent variables used within the field of entrepreneurship are: first, the field's lack of a "unifying theory or the complexity associated with entrepreneurship as an area of management scholarship" or second, "the breadth and depth of the entrepreneurship domain warrant assessment through the contexts suggested by several or perhaps many dependent variables" (Ireland et al, 2005 p. 561). Although entrepreneurship as a field is hardly unified, I submit that the second reason is the primary antecedent for entrepreneurship's numerous dependent variables. That is, the breadth of dependent variables used is appropriate because there are many contexts that the theories of entrepreneurship are relevant to. Additionally, that entrepreneurship as a domain includes the *processes* that lead to new economic activities coupled with the practical limits to capturing entire processes within one study, results in the use of many dependent variables. Specifically, the study of the long set of processes which ultimately lead to the introduction of new economic activity, might be broken into separate studies in which the dependent variable in the earlier study becomes the independent variable in a subsequent study, and so on. As such, it is not surprising to see the large number of dependent variables used within entrepreneurship as well as the variety in stage of used dependent variables (Ireland et al, 2005).

In addition to widening the appropriate contexts for studying entrepreneurial phenomena, phenomenon-driven research will reduce the ongoing mistake of studying every noticeable aspect of small, new, and owner-managed firms and labeling the research entrepreneurship (Wiklund et al, 2001). Wiklund et al (2011 p. 6) summarise these two important features, stating that "not all aspects related to small and new business amount to entrepreneurship, but several phenomena in other arenas are entrepreneurial and can be understood best by entrepreneurship scholars."

Another problem related to context-driven research is that it can lead to the mistake of sampling on the dependent variable. For example, deciding upon studying 'growth firms' and then finding something interesting about growth firms to study, "leads to the Deadly Sin of sampling on the dependent variable" (Davidsson, 2004 p. 147). Carroll and Mosakowski (1987 p.572) explain that studies "which draw samples based on some value of the dependent variable, suffer from the serious methodological problem of sample-selection bias." Despite the seriousness of this bias, however, Davidsson (2004) explains that there are times when this is not too large of a problem; for example, if growth is the phenomenon a researcher wishes to explain, then the researcher must study growth firms to capture meaningful variance in the dependent variable; notice though, the phenomenon-driven nature of the latter example. Phenomenon-driven research, then, versus context-driven research, is more capable of increasing our understanding of entrepreneurship because it results in more representative samples and acts as a guide in the process of selecting dependent variables. In sum, my argument is simply for scholars to ask themselves which is more interesting: the phenomenon under study or the context used to study it and then design their research based on their answer; in my view, the phenomenon is more interesting than the context.

Domain Delineation

As discussed, it is a unique set of phenomena explained or predicted, not a unique conceptual framework that explains and predicts a set of phenomena already covered by other fields, which delineates a domain (Shane & Venkataraman, 2000). Expressed another way, that a domain offers new explanations to a set of phenomena already covered in other fields, may not be sufficient to delineate a domain; rather, offering explanations to an otherwise unexplained set of phenomena is the mark of a delineated domain (Davidsson, 2004). In other words, it is the dependent variables—versus the independent variables—which help delineate a domain.

Again, this leads to the question: what, then, are the unique dependent variables that entrepreneurship research helps explain or predict? According to my accepted view, the dependent variables in entrepreneurship research should be associated with the phenomenon of the emergence of new economic activity. However, in a recent review of entrepreneurship research which was published in the top four entrepreneurship journals, Hechavarria (2009 p. 4) notes that "the primary emphasis [of published entrepreneurship research] has centered on characteristics other than business creation." Many of the published studies instead used dependent variables of firm performance (9.77%), growth or market share (6.43%), and internalisation (6.43%) to name a few (Hechavarria, 2009). Although these in-use dependent variables help entrepreneurship research contribute something to related fields such as strategic management, for example, they do not help delineate the entrepreneurship domain itself because these dependent variables are often explained in other fields. However, I am not making the argument that these dependent variables should not be studied at all within entrepreneurship research, which is an issue I will come back to shortly.

Because phenomenon-driven entrepreneurship research requires careful selection of dependent variables associated with the phenomenon motivating the research, it can help define the domain's boundaries, so long as the phenomenon is unique to the domain. Dependent variables which help us explain and predict the emergence of new economic activity, should dominate the studies within the domain, with other dependent variables included in the domain, but peripheral. Examples of dependent variables that are central might include: start-up status, such as operating, still trying, currently inactive, and disbanded (Lichtenstein, Dooley, & Lumpkin, 2006); new-product introduction or product novelty (Bhave, 1994); the expectations of entrepreneurs (Delmar & Davidsson, 1999); opportunity discoveries (Shane, 2000); and entrepreneurial intentions to name a few (Krueger & Carsrud, 1993). All of the examples in this otherwise diverse list of dependent variables share two common and salient characteristics: they (1) all help us better explain and predict the unique phenomenon of emergence of new economic activity, and (2) they can all be studied under multiple contexts. That is, these examples illustrate how the selection of dependent variables based on phenomenon-driven research results in choosing dependent variables based on their fit with the phenomenon rather than the context. It follows that selecting dependent variables which help explain a unique phenomenon, rather than a context such as small or new firms, helps delineate entrepreneurship as a unique domain.

Now that I have addressed how phenomenon-driven research can help delineate a domain, I need to address the somewhat contradictory statement that the domain should not be limited to only the study of its unique phenomena (Davidsson, 2004). I emphasise two reasons for including studies which do not directly address the unique phenomena of entrepreneurship per se within the domain of entrepreneurship research: first, following Davidsson (2004), the future outcomes of entrepreneurship, or the phenomena which result from 'entrepreneurial' action are presently unknown; and second, research domains should contribute to one another requiring some overlap which may require extending studies beyond the core phenomena of interest in entrepreneurship. Although there are admittedly other reasons for separating the phenomenon from the domain, these two reasons have salient implications for dependent variables.

First, "we have to be able to study entrepreneurship as it happens" (Davidsson, 2004 p. 17); yet the future outcomes (dependent variables) are unknowable. Therefore the 'phenomena' of entrepreneurship are not completely definable at any point in time; in other words all of the dependent variables that *will be* important to study in order to better understand entrepreneurial phenomena are yet unknown. As such, it follows that phenomenon-driven research is not the all-encompassing answer to the difficult question of how we delineate the domain of entrepreneurship. Rather, I posit that because phenomenon-driven research results in the careful selection of dependent variables which are meaningful to the phenomenon of interest, such research *helps* separate a domain as unique by mitigating the use of hodgepodge dependent variables which are better classified as relevant to a context than to a research domain.

Second, a domain should, indeed, offer a conceptual framework which helps explain and predict a unique set of phenomena (Shane & Venkataraman, 2000); however, entrepreneurship can also "make strong contributions to social science at large" (Davidsson, 2004 p. 29). For example, entrepreneurship research contributes to economics by helping explain one of economics' otherwise-unaccounted for key inputs or assumptions, the emergence of new firms through entrepreneurial ability. Similarly, entrepreneurship research may usefully extend beyond dependent variables associated with only the emergence of economic activity to include constructs associated with relative performance, for example, to contribute to strategic management. However, it is my contention that such research should be peripheral to the entrepreneurship domain, not core. Another way that entrepreneurship can contribute to social science at large is through utilizing dependent variables at different levels; levels will be discussed in a subsequent section.

Dependent Variable Issues in Entrepreneurship

As discussed, entrepreneurship's unique domain is closely tied to the emergence of new economic activity (Wiklund et al, 2011); there are many appropriate dependent variables that can help us better understand emergence as a phenomenon. As examples, an entrepreneurship researcher might appropriately study the relationship between: gestation activities and the probability of actual business foundation, past entrepreneurial experience and confidence in current startup venture, or entrepreneurial intentions and later changes to an intended path or plan (c.f. Davidsson, 2004). With so many relevant dependent variables and diverse conceptual frameworks for predicting and explaining them, problems associated with heterogeneity are unavoidable (Davidsson, 2004). Also, emergence can occur, and subsequently influence other variables, at different levels (Davidsson, 2004). In this section, I discuss the issues of heterogeneity and levels of analysis separately.

Heterogeneity and Dependent Variables in Entrepreneurship Research

Scholars note that heterogeneity is assumed in entrepreneurship (Davidsson, 2004). Indeed, heterogeneity occurs at all stages of entrepreneurship (Davidsson, 2004). For example, heterogeneity is prevalent in: *individuals'* experiences, cognitive capacities, skills, motivations, and resources; *ventures'* starting conditions in ways such as founding team versus individual, time, space, and governance structures; *environmental conditions*, such as the industry or market that new economic activity emerges in; and *outcomes* such as profitability, change or stability in path, and attitudes (e.g. Schultz, 1975; Cohen & Levinthal, 1990; Johnson, 1990; Fiet, 2000; Venkataraman, 2000; Davidsson, 2004; Gimeno, Folta, Cooper, & Woo, 1997; Aldrich & Fiol, 1994; Zahra & Dess, 2001). With a focus on emergence as a phenomenon, I emphasise heterogeneity associated with dependent variables.

Davidsson (2004 p. 20) notes a common practice of operationalizing emergence as the “creation of new organisations” or in some other, similar manner. As there is no ‘ideal’ dependent variable or outcome in entrepreneurship, which dependent variable is selected becomes very important (Davidsson & Gordon, 2011). Once a dependent variable is selected, the method of operationalisation is also important. Indeed, regardless of whether a researcher chooses to operationalise the creation of a new organisation or some other ‘thing’ related to emergence, temporal heterogeneity creates an important issue regarding the operationalisation of the dependent variable. Imagine a study that incorporates Event History Analysis on some entrepreneurial data set, for example, to predict the probability of firm founding as a dependent variable; at what point does the research code the dichotomous dependent variable as a one? If researchers chooses sales tax as the indicator for firm founding, they run the risk of incorporating many small firms while excluding firms in industries in which first sales appear much after firm founding (e.g. pharmaceuticals) (Dahlqvist, Davidsson, & Wiklund, 2000). Alternatively, researchers may choose to use a registration with a municipality to indicate emergence. Doing so, however, treats equally those firms that are impacting the economy in meaningful ways and those which were registered for the mere purpose of setting up a trust for liability reasons, for example. In other words the timing of the registration may differ in relation to the motivations for the registration. Similarly, researchers may risk excluding innovation efforts from small firms when research and development expenditures are used to operationalise innovation (Hall & Lerner, 2009). Making the issues of heterogeneity associated with operationalizing dependent variables is not intended to discourage research; rather, the intent is to encourage careful, well thought selection of dependent variables along with their operationalisation. In addition to careful selection, a detailed description of the selection logic can help in dealing with heterogeneity (Davidsson & Delmar, 2009).

In addition to recommending theorizing and detailed, explicit explanation of the logic followed when operationalizing constructs that are chosen to be included in a study, Davidsson and Delmar (2009) offer methods to deal with unobserved heterogeneity. That is, heterogeneity that may bias results due to excluded variables which may, indeed, have influence on the variance in the measured dependent variable. The primary method suggested to deal with unobserved heterogeneity is the use of longitudinal data (Davidsson & Delmar, 2009). It is impossible to include every variable that has some influence on the dependent variable in a study. Researchers do their best to incorporate those control variables that have been shown to explain a meaningful portion of the dependent variable variance; but inevitably, some control variables are excluded (Stevens, 2002). Indeed, including *every* control variable would result likely result in mass correlations which do not reveal much information about the variance in the dependent variable anyway. In other words, having some excluded variables is unavoidable, and perhaps even desirable. Cases in longitudinal data, however, “can serve as their own controls” and, therefore, help deal with unobserved heterogeneity (Davidsson & Delmar, 2009 p. 35).

Another *method* of dealing with heterogeneity is the use of particular statistical methods. For example, Samuelsson and Davidsson (2009) use Longitudinal Growth Modeling (LGM) in their study of variation in opportunities influence on innovative processes because of heterogeneity associated with the state of the venture at the first wave of data collection. Specifically, LGM can model the initial state of the process to help deal with the temporal heterogeneity that exists because it is unrealistic to capture a sample of ventures that all start their processes at the exact same time (Samuelsson & Davidsson, 2009). Although this approach is aimed at dealing with heterogeneity associated with the stage of the process at the first wave of data collection, it is worth including here as it is appropriate for studying processes, which are often relevant, and operationally challenging dependent variables in entrepreneurship. Certainly, LGM is not the only appropriate method for dealing with heterogeneity; hopefully, though, the example of LGM illustrates the point that to some degree heterogeneity can be dealt with.

As mentioned, controls are a common methodological approach to dealing with heterogeneity. Although control variables are recommended in general, their usefulness is dependent on the researcher's knowledge regarding which control variables to include as there is likely an inverted-U shape relationship between the number of control variables included and the benefits to the model (c.f. Davidsson, 2004). That is, over-reliance on control variables to deal with heterogeneity results in a long list of significantly correlated predictors, which can actually complicate the ability of the researcher to make sense out of the results.

Levels Issues Associated with Dependent Variables in Entrepreneurship Research

The emergence of new economic activity as an outcome is influential at different levels, for example: individuals' and team members' wealth generation;; job creation for regions, states, and countries; and attitudes and motivation of employees and teams within a firm (Hechavarria, 2009). That entrepreneurship, like many social phenomena, occurs at and across various levels has implications as regards to: sampling, clearly defining what is nascent, and linking entrepreneurship dependent variables with other social science domains (Davidsson, 2004). Using examples of various, relevant levels within entrepreneurship, I will discuss each of these implications in turn. Over fifty percent of new ventures are started by teams (Davidsson & Gordon, 2011); however, many studies do not distinguish between team and individual startups despite a clear divergence in level of analysis. Similarly, despite the prominence of team foundings, teams are rarely studied within entrepreneurship research (Hechavarria, 2009). Indeed, entrepreneurship research should include studies at the team level. Some scholars may be tempted to argue that some dependent variables of interest are the same regardless of whether a venture is founded by a team or an individual; however, the measured variance in dependent variables may be biased toward team ventures (Davidsson, 2004). Specifically, a sampling logic which 'randomly' selects subjects from the general population is more likely to select team-founded ventures simply because such ventures are represented by more individuals within the general population. If the variance in dependent variables is different for team-founded ventures than it is for individual- founded ventures, then the measured variance in dependent variables will be biased.

Davidsson and Gordon (2011) note that team-founded ventures are indeed different; for example, teams are comparatively ambitious and are, therefore, more likely to start ventures that require more complex processes and longer startup durations. As such, the oversampling of team-based ventures biases samples to high ambition startups. When samples are biased, results are biased. The more biased results are, the more questionable the reliability of the 'knowledge' the study is purportedly adding to social science. Reducing bias in any way possible, then, is important in social science research. Some offered resolutions to the bias problem associated with over sampling teams include subgroup and sensitivity analysis (Davidsson & Gordon, 2011).

Clearly the level of analysis has implications on sampling. As discussed, some entrepreneurship researchers operationalise new economic activities as 'nascent' ventures. However, what is theorised and what is operationalised as nascent are often different (Davidsson & Gordon, 2011); specifically, entrepreneurship scholars need to better define what is nascent, the individual entrepreneur or the venture and then sample accordingly. For example, does a new venture started by a serial entrepreneur meet the requirements 'nascent'? Similarly, does a spin-off of an existing company by an inexperienced (zero prior startups) entrepreneur indicate a 'nascent' case? Explicit, and clear, definitions of the level of analysis within individual studies would greatly help researchers make sense of aggregate studies; however, the extant literature shows some neglect in this area. In Hechavarria's (2009) sample of articles, almost one-third of studies did not state the level of analysis. In short, we know that entrepreneurship occurs at multiple levels; in order to uncover relationships at those levels research needs to clearly define what the level of analysis is and sample accordingly, otherwise dependent variable variance is likely biased.

One of the benefits of the cross-level nature of entrepreneurial phenomena is the subsequent-contributions to other domains that result (Davidsson, 2004). Indeed, "many scholars purport a theoretical relationship between entrepreneurship and economic well-being at regional and national levels" (Hechavarria, 2009 p. 20). Entrepreneurship can make contributions to social science by explaining dependent variables which other fields do not explain, but which other fields and society care about (Davidsson, 2004). Some examples of dependent variables at various levels that entrepreneurship is particularly suited to explain which other fields care about are: situations that benefit societies on the whole, but are detrimental to a micro-level venture such as creative destruction (e.g. Schumpeter, 1934; Baumol, 1996; Davidsson, 2004); the innovativeness of regions (e.g. Benfratello, Schiantarelli, & Sembenelli, 2008); variation in performance across industries or of individual ventures within an industry (e.g. Barney, 1986; Porter, 1980; Caves & Ghemawat, 1992); and employee recruitment and selection problems faced by certain types of firms (e.g. Heneman, Tansky, & Camp, 2000).

Many of the dependent variables in entrepreneurship are independent variables or assumptions of other domains. For example, strategy scholars have studied the location of firms as a predictor of their access to new knowledge; specifically, firms located in innovative regions (a potential dependent variable in entrepreneurship) are theorised to have greater access to new technological information (Almeida, 1996). Therefore, offering explanations and empirical evidence regarding the phenomena of the emergence of innovative regions as Bonfratello et al (2008) do, contributes to social science at large through its contribution to one of strategy's independent variables. Similar to this example, it is often cross-level research that provides the ability to make such contributions.

Although there are many appropriate levels to study within entrepreneurship—including cross-level research as discussed—it is often beneficial to gather data at lower levels because individual level data can, sometimes, be aggregated to operationalise higher level constructs (Davidsson, 2004). This is helpful because it is often difficult to measure outcomes directly at high levels such as region or nation. The Global Entrepreneurship Monitor (GEM) is one such effort that uses the aggregating methodology. GEM survey's the adult population of nations and subsequently aggregates responses to create indicators of national level variables. Some potential, nation-level dependent variables that result from this effort are: innovativeness, competitiveness, and growth expectations. It is easy to see the difficulty in measuring the growth expectations, for example, of a nation without using an aggregate methodology.

Why include discussions regarding heterogeneity and levels together? One reason is to discuss the sources of heterogeneity that arise at different levels of analysis (Thornton, 1999). Following Thornton (1999), I will briefly emphasise heterogeneity that arises at four common levels of analysis: individuals, organisations, markets, and environments. Individuals are sources of heterogeneity largely due to stable differences in psychological traits (Shaver & Scott, 1991). The premise here is that people start the ventures that ultimately introduce new economic activities; as such, this lens focuses on the differences in psychological traits, such as: locus of control, need for achievement, autonomy, and risk aversion (Shaver & Scott, 1991). It is easy to imagine individuals differing on these traits; however, not all individual level studies measure and control for differences in these traits. It follows those individual differences in psychological traits can serve as sources of heterogeneity (Thornton, 1999).

Organisation-level sources of heterogeneity include: organisation size (Hannan & Freeman, 1977); organisational forms (Thornton, 1999); and organisational cultures (Beugelsdijk, 2007). As discussed, entrepreneurial theories are applicable to more than the context of small and new organisations; however, this does not justify the haphazard inclusion of all sizes of organisations without theorizing, or at a minimum controlling, regards to size influences on the variation in the dependent variable. Thornton (1999) notes that the heterogeneity associated with the large variety in organisational forms presents an opportunity for future research, especially for the study of populations. Specifically, Thornton (1999, p. 37) contends that multidivisional form organisations are, to date, unexplored because they “violate theoretical assumptions of homogeneous population boundaries.”

Although scholars sometimes theorise the outcomes of entrepreneurship as resulting from path dependencies (Sarasvathy, 2003), judgments regarding resource attribute values (Klein, 2008), or some factor related to the abilities or stock of knowledge that entrepreneurs hold (Ardichvili, Cardozo, & Ray, 2003), it is often the case “that foundings occur in waves that correspond with market cycles” (Thornton, 1999 p. 38). That is, acquisition waves, growth markets, recessions, and other environmental level factors cause heterogeneity issues associated with studying the outcome of new economic activities.

Finally, a central lens within entrepreneurship as a domain views opportunities as resulting from the distribution of information about resources, attributes, and signals in the environment (c.f. Companys & McMullen, 2007). This view is central because it offers a broad range of outcomes to study, including: the entrepreneur's role in market processes (Kirzner, 1997; Hayek, 1945); how the economic productivity function is shifted outwards (versus maximizing production on a stable productivity function in neoclassical economics) (Schumpeter, 1934); and how wealth can be destroyed through rent seeking (Baumol, 1996). In other words, the environment influences all of these, and other, outcomes. As such, the environmental sources of heterogeneity need to be examined or at least controlled for (Thornton, 1991).

Conclusions and Limitations

Conclusions

Herein, I discussed the criticality of proper selection and operationalisation of dependent variables within entrepreneurship research focusing specifically on phenomenon-driven research and issues related to heterogeneity and levels of analysis. The examples offered in preceding sections are meant to be illustrative rather than quintessential or all-inclusive. The issues associated with dependent variable selection and operationalisation are important to the delineation of the domain of entrepreneurship, the reliability of the results entrepreneurship researchers uncover, and the contributions that entrepreneurship research can provide to other social science fields.

Entrepreneurship's unique contribution to science needs to explain dependent variables that other fields do not, and need not, explain (Davidsson, 2004). At the same time, entrepreneurship research hopefully will offer explanations of phenomena that other fields do care about to some degree. Dependent variables are akin to phenomena; selection of dependent variables, therefore, should be based on the phenomenon of interest rather than some context. Although this contention may appear obvious, it is one worth emphasizing because a large portion of entrepreneurship research has instead focused on studying the context of small, young, or owner-managed firms rather than what is interesting (the phenomenon) about them per se (Wiklund et al, 2011).

Instead, focusing on the phenomena that are unique to entrepreneurship research widens the context of entrepreneurship, helps delineate it from other domains, and illustrates the need for closer attention to the issues associated with dependent variable selection in entrepreneurship research, including heterogeneity and levels of analysis (c.f. Wiklund et al, 2011).

These implications result in several tangible recommendations for future researchers, namely: designing research based on phenomenon rather than contexts; within practical constraints avoid sampling on the dependent variable; detailing the logic for selection of dependent variables and their operationalisation; using statistical techniques to help deal with heterogeneity; multi-level (including cross-level) studies; and among these recommendations, I want to re-emphasise selecting dependent variables based on phenomena that are within the domain; specifically the selection of dependent variables establishes whether or not entrepreneurship as a domain is, indeed, "explaining and predicting a set of phenomena not explained or predicted by conceptual frameworks already in existence in other fields" or not (Shane & Venkataraman, 2000). It is not sufficient to offer novel explanations to phenomena already covered in other fields to legitimise the independence of entrepreneurship as a domain.

Limitations

Some specific limitations of this paper include its finite list of examples, its lack of empirical evidence, and finally its scope. I will discuss each of these in turn. First, readers probably noticed the incompleteness of this paper's offered lists of: dependent variables; problems associated with the operationalisation of dependent variables, including heterogeneity and levels of analysis; and recommendations for methods to improve entrepreneurship research in these regards. Although the incompleteness of these lists, indeed, limits the scope of this paper's potential influence, the intent of this paper is not to provide such lists in their completeness; rather, illustrative examples were offered to provoke thought—and hopefully subsequent action—regarding the design of future entrepreneurship studies. Specifically, thought in relation to the left hand side of models, which is often under-emphasised in the statistical texts we read. The true measure of this limitation is the degree to which such thoughts were provoked or not.

Among the incomplete lists mentioned, the finite list of recommendations for methods to improve entrepreneurship research is the greatest limitation of this paper. Admittedly, there are likely many statistical, theorizing, and other methods that are not offered herein which may help deal with problems associated with dependent variables in entrepreneurship research. These excluded methods are not excluded because they are less useful; rather they are excluded because the vastness of the appropriate dependent variables within entrepreneurship's domain results in a vast problems, and subsequently vast methods of dealing with such problems. This is precisely the reason that I decided to approach this paper through illustrative examples rather than through claimed all-inclusive lists of examples and recommendations.

Second, the empirical evidence in this paper is limited to citations of other studies' evidence and is often simple, such as citing the percent of studies that use certain dependent variables. A meta-analysis may have provided more convincing empirical evidence as to the problems associated with the current state of selection and operationalisation of dependent variables; however, other papers already provide a great deal of such evidence (e.g. Hechavarria, 2009). Therefore, I decided to focus this paper on illustrative examples of these issues which hopefully helps readers relate to and subsequently arrive at solutions to their specific design issues. That said, the lack of empirical evidence in this paper is, indeed, a limitation.

Finally, this paper is limited in scope by focusing on only the right hand side of statistical models, dependent variables. My emphasis on dependent variables is not intended to downplay the importance of ensuring the selection and measurement criteria associated with independent variables and controls are satisfied. A well designed research setting includes careful consideration for what is included in the model, and how each piece of the model is operationalised. Furthermore, and perhaps most importantly, detailing the logic used for making these critical decisions helps social scientists better grasp what is truly learned from a study as well as how to better design future studies.

References

- Aldrich, H. E., & Fiol, C. M. (1994). Fools rush in? The institutional context of industry creation. *Academy of Management Review*, 19(4), 645-670.
- Almeida, P. (1996). Knowledge sourcing by foreign multinationals: patent citation analysis in the US semiconductor industry. *Strategic Management Journal*, 17(Winter Special Issue), 155-165.
- Ardichvili, A., Cardozo, R., & Ray, S. (2003). A theory of entrepreneurial opportunity identification and development. *Journal of Business Venturing*, 18(1), 105-123.
- Barney, J. B. (1986). Strategic factor markets: expectations, luck, and business strategy. *Management Science*, 32(10), 1231-1241.
- Baumol, W. J. (1968). Entrepreneurship in economic theory. *The American Economic Review*, 58(2), 64-71.
- Baumol, W. J. (1996). Entrepreneurship: Productive, unproductive, and destructive. *Journal of Business Venturing*, 11(1), 3-22.
- Benfratello, L., Schiantarelli, F., & Sembenelli, A. (2008). Banks and innovation: Microeconomic evidence on Italian firms. *Journal of Financial Economics*, 90(2), 197-217.
- Beugelsdijk, S. (2007). Entrepreneurial culture, regional innovativeness and economic growth. *Journal of Evolutionary Economics*, 17(2), 187-210.
- Bhave, M. P. (1994). A process model of entrepreneurial venture creation. *Journal of Business Venturing*, 9(3), 223-242.
- Carroll, G. R., & Mosakowski, E. (1987). The career dynamics of self-employment. *Administrative Science Quarterly*, 32(4), 570-589.
- Castaños, C., & Welsh, D. H. B. (2013). Training Marriage and Family Therapists as Family Business Advisors: A supervisory model. *Academy of Entrepreneurship Journal* (19)(1), 1-40.
- Caves, R. E., & Ghemawat, P. (1992). Identifying mobility barriers. *Strategic Management Journal*, 13(1), 1-12.
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 128-152.
- Company, Y. E., & McMullen, J. S. (2007). Strategic entrepreneurs at work: The nature, discovery, and exploitation of entrepreneurial opportunities. *Small Business Economics*, 28(4), 301-322.
- Dahlqvist, J., Davidsson, P., & Wiklund, J. (2000). Initial conditions as predictors of new venture performance: A replication and extension of the Cooper et al. study. *Enterprise and Innovation Management Studies*, 1(1), 1-17.
- Davidsson, P. (2004). *Researching entrepreneurship* (Vol. 5). Springer Verlag.
- Davidsson, P., & Delmar, F. (2009). Dealing with heterogeneity in entrepreneurship research. *Working Paper*.
- Davidsson, P., & Gordon, S. R. (2011). Panel studies of new venture creation: a methods-focused review and suggestions for future research. *Small Business Economics*, *In press*, 1-24.
- Delmar, F., & Davidsson, P. (1999). Firm size expectations of nascent entrepreneurs. In P.D. Reynolds, W. D. Bygrave, S. Manigart, C. Mason, G. D. Meyer H. J. Sapienza & K. G. Shaver (Eds.). *Frontiers of Entrepreneurship Research* (Vol. 19, pp. 90-104). Presented at the Wellesley, MA: Babson College.
- Dhilwayo, S. (2014) Entrepreneurship and Competitive Strategy: An Integrative Approach, *Journal of Entrepreneurship* 23(1), 115-135.

- Fiet, J. O. (2000). Entrepreneurial competence as knowledge. *Annual Meeting of the Academy of Management, Toronto, Canada.*
- Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative science quarterly*, 750-783.
- Hall, B. H., & Lerner, J. (2009). *The financing of R&D and innovation*. National Bureau of Economic Research Cambridge, Mass., USA.
- Hannan, M. T., & Freeman, J. (1977). The population ecology of organizations. *American journal of sociology*, 82(5), 929-964. Hayek, F. A. (1945). The use of knowledge in society. *The American Economic Review*, 519-530.
- Hechavarría, D. (2009). A Review of Research Programs for the Study of Entrepreneurship: A Critical Discussion of Theoretical and Measurement Implications. *Working Paper.*
- Heneman, R. L., Tansky, J. W., & Camp, S. M. (2000). Human resource management practices in small and medium-sized enterprises: Unanswered questions and future research perspectives. *Entrepreneurship theory and practice*, 25(1), 11-26.
- Ireland, R. D., Reutzell, C. R., & Webb, J. W. (2005). Entrepreneurship research in AMJ: What has been published, and what might the future hold? *Academy of Management Journal*, 48(4), 556-564.
- Johnson, B. R. (1990). Toward a multidimensional model of entrepreneurship: The case of achievement motivation and the entrepreneur. *Entrepreneurship Theory and practice*, 14(3), 39-54.
- Kirzner, I. M. (1997). Entrepreneurial discovery and the competitive market process: An Austrian approach. *Journal of economic Literature*, 35(1), 60-85.
- Klein, P. G. (2008). Opportunity discovery, entrepreneurial action, and economic organization. *Strategic Entrepreneurship Journal*, 2(3), 175-190.
- Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship & Regional Development*, 5(4), 315-330.
- Lichtenstein, B. B., Dooley, K. J., & Lumpkin, G. T. (2006). Measuring emergence in the dynamics of new venture creation. *Journal of Business Venturing*, 21(2), 153-175.
- Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and companies*. New York/London.
- Samuelsson, M., & Davidsson, P. (2009). Does venture opportunity variation matter? Investigating systematic process differences between innovative and imitative new ventures. *Small Business Economics*, 33(2), 229-255.
- Sarasvathy, S. D. (2003). Entrepreneurship as a science of the artificial. *Journal of Economic Psychology*, 24(2), 203-220.
- Schumpeter, J. A. (1934). The fundamental phenomenon of economic development. *Schumpeter, The Theory of Economic Development*, 57-94.
- Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4), 448-469.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217-226.
- Shaver, K. G., & Scott, L. R. (1991). Person, process, choice: The psychology of new venture creation. *Entrepreneurship Theory and practice*, 16(2), 23-45.
- Stevens, J. (2002). *Applied multivariate statistics for the social sciences*. Lawrence Erlbaum. Thornton, P. H. (1999). The sociology of entrepreneurship. *Annual Review of Sociology*, 25, 19-46.
- Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1), 217-226.
- Wiklund, J., Davidsson, P., Audretsch, D. B., & Karlsson, C. (2011). The future of entrepreneurship research. *Entrepreneurship Theory and Practice*, 35(1), 1-9.
- Zahra, S., & Dess, G. G. (2001). Entrepreneurship as a field of research: Encouraging dialogue and debate. *Academy of Management Review*, 26(1), 8-20.