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**Panel Studies of New Venture Creation:
A Methods-Focused Review and Suggestions for Future Research**

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Abstract

Longitudinal panel studies of large, random samples of business start-ups captured at the pre-operational stage allow researchers to address core issues for entrepreneurship research, namely the processes of creation of new business ventures as well as their antecedents and outcomes. We perform a methods-orientated review of all 79 journal articles that have used this type of data set, our purpose being to assist users of current data sets as well as designers of new projects in making the best use of this innovative research approach. Our review reveals a number of methods issues that are largely particular to this type of research. We conclude that amidst exemplary contributions much of the reviewed research has not adequately managed these methods challenges; nor has it made use of the full potential of this new research approach. Specifically, we identify and suggest remedies for context-specific and interrelated methods challenges relating to *sample definition*; choice of *level of analysis*; *operationalization and conceptualization*; *use of longitudinal data*, and dealing with various types of *problematic heterogeneity*. In addition, we note that future research can make further strides towards full utilization of the advantages of the research approach through better matching (from either direction) between theories and the phenomena captured in the data, and by addressing some under explored research questions for which the approach may be particularly fruitful.

**Panel Studies of New Venture Creation:
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1. Introduction

Examining the earliest stages of venture creation is an important but challenging task for entrepreneurship research. This is why the occurrence of a longitudinal approach to the systematic, large-scale study of on-going new venture start-up processes ‘as they happen’ is potentially an important breakthrough. The *Panel Study of Entrepreneurial Dynamics* (PSED) (Gartner et al., 2004b; Reynolds, 2007) was the first full scale realization of such a project. The PSED and related projects have demonstrated that it is practically possible to apply random sampling at a very early stage of venture development and to get a large proportion of identified *nascent entrepreneurs* (NE) to complete comprehensive surveys in multiple waves of longitudinal data collection (Gartner et al., 2004b; Samuelsson & Davidsson, 2009). In addition to capturing phenomena at the heart of entrepreneurship, these projects share a number of methods advantages. The sampling of ventures before they could be considered operational reduces issues of survivor bias. The longitudinal design permits the study of process issues as well as time separation of independent (IV) and dependent variables (DV) for improved tests of causality. Further, the real time following of the development of the start-up process reduces issues of memory decay and hindsight bias.

New research approaches, such as this, also introduce new methods challenges, or require adapted solutions to known types of methods problems. In this article we review from a methods point of view all journal-published articles using random sampling-based, concurrent and longitudinal data sets containing data about emerging ventures and their founders. We call this ‘PSED-type data sets’ and research using ‘the PSED approach’. The purpose of our review is to assist users of existing data sets as well as designers of new projects of this kind in making the best use of this research approach. We are thus undertaking a different type of review, focusing on methods-related problems and solutions rather than on the strength of evidence in relation to particular research questions or theories. Throughout, we place the main emphasis on methods issues that are particular to this research stream.

We make three contributions. First, and most importantly, we provide direct advice to researchers using extant, PSED-type data sets as well as designers of new such projects regarding what particular methods problems need to be addressed and how solutions can be reached. Second, we provide guidance for users of the research, including reviewers of new journal submissions, in assessing the validity of results reported in

individual articles using the PSED approach. Third, our methods-focused review reveals future opportunities in terms of under studied research questions and areas in need of theoretical development.

In the next section we describe the process by which articles were selected, coded, and evaluated. We then delineate three sub-streams of research focusing on *Person*, *Process* and *Outcome*, identifying method issues associated with each. This is followed by a quantitative analysis of the extent to which authors have addressed the identified methods challenges. Finally, we present the opportunities for further improvements that are available to users of extant data sets and designers of new projects, respectively. In appendices, we provide supplementary information regarding more detailed content of the research streams (Appendix 1) and their relative publishing success (Appendix 2), as well as brief presentation of some exemplar studies that have dealt particularly well with some of the methods challenges that we have identified (Appendix 3).

2. Article selection and coding

Our review includes all empirical, peer reviewed, published or accepted/in press journal articles which are based on PSED-type data sets. We require that the data set a) builds on random sampling through screening interviews with a very large number of adults, usually selected through random digit dialing to household phones; b) identifies cases at a pre-operational (but beyond ‘mere idea’) stage; c) requires that the respondent be a (co-)owner of the venture; d) contains comprehensive information about the venture and its founders, and e) follows eligible cases longitudinally (cf. Reynolds, 2007; 2009). We also require that the articles address substantive research questions rather than being purely methods-orientated. Through a comprehensive search using prior knowledge, keywords, author names and citations we were able to locate 83 eligible articles based on nine data sets from Canada (7 articles/1 data set), China (1/1) Netherlands (3/1), Norway (3/1), Sweden (11/1) and the US (58/4). Appendix 1 provides detailed information on which reviewed articles are based on which country/data set. Importantly, our selection constitutes *the population* of empirical, random-sample-based articles studying the pre-operational stage of venture creation using longitudinal data sets. Articles based on other data sets do not cover the same phenomenon in a comparable fashion. Focusing on the 83 journal articles we recognize that the research stream has also yielded other types of publications (see Frid et al., 2010) to which we make occasional reference; mostly on technical or purely descriptive matters.

The review work developed iteratively, starting with the authors performing a traditional content review of a large sub-set of the 83 articles, combined with a search for methods issues and solutions revealed through the respective articles’ approaches to answering their research questions. In the next stage, we independently coded all articles according to a large number of methods-related criteria. This was in itself an

iterative process, where criteria were added and coding rules successively refined as needed. For factual matters any instances of discrepancy between the coders were resolved through re-checking the article in question. For criteria involving a larger element of judgment differences were resolved by discussing what would be the most suitable classification, after re-examining the article together. For criteria where the discrepancies were frequent we either recommenced with refined coding criteria or abandoned further use of the classification category. Consequently, for the criteria used below the number of issues to resolve was typically small and easy to resolve.

3. Background on three sub-streams

In Figure 1 we first classify the articles into three areas that capture most of the research well, namely Characteristics of Nascent Entrepreneurs (*Person* – 42 articles); Antecedents and Characteristics of the New Venture Creation Process (*Process* – 34 articles), and Explaining New Venture Creation Process Outcomes (*Outcomes* – 43 articles). Technically the classification is relatively straightforward based on what the article tries to describe or explain; usually it reflects the dependent variable(s). As indicated by the figure, 33 articles address more than one of these three areas. Articles where a main classification other than those in Figure 1 would be more suitable are scarce. For example, very few articles could be said to focus on ‘the opportunity’ or the ‘individual-opportunity nexus’ (Shane & Venkataraman, 2000).

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Insert Figure 1 about here!

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Because methods issues and solutions vary depending on the research questions we use the three sub-streams in Figure 1 as a structuring mechanism in the remainder of this manuscript. This will also demonstrate that researchers addressing intersections D-G face particular combinations of methods challenges.

4. Methods observations from the Person sub-stream

The Person sub-stream revisits questions about the characteristics of entrepreneurs with the benefit of reduced risk of survivor bias and reverse causality. Most articles in this sub-stream address differences between NEs and the general population (17 articles) or contrasts among sub-groups of NEs (26 articles). With 22 articles, the category focusing solely on ‘Person’ has been the largest in number of articles (Figure 1) but the least successful of the three sub-streams in terms of publishing in top tier journals (Table A4, Appendix 2). A

likely reason is that research in this sub-stream is relatively less novel or unique. Characteristics of entrepreneurs have been studied in projects other than those reviewed here, including studies employing random sampling at a pre-operational stage, such as research based on *Global Entrepreneurship Monitor (GEM)*¹ data (Bergmann et al., 2009; Reynolds et al., 2005). Although research in the Person sub-stream has led to new insights about characteristics of business founders and founding teams (e.g., Carter et al., 2003; Ruef et al., 2003) this seems not to be primarily related to using pre-operational stage sampling or longitudinal follow-ups.

The Person topic is consistent with the sampling mechanism, which aims at a representative sample of *individuals* involved in business start-up efforts (NEs). As we shall see, the other sub-streams are more problematic in this regard. However, the research has shown that *sample definition* – i.e., to operationalize who is a ‘nascent entrepreneur’ – is not a trivial task (Shaver et al., 2001; Reynolds, 2009). Successive refinements of the screening mechanism seem to have reduced problems of under coverage while increasing to potentially problematic levels the number of possibly under qualified cases retained in the sample. These are individuals who meet the screening criteria but who in comprehensive follow-up interviews show low levels of activity and do not seem to be very serious about taking their start-up attempts to the market – or to termination. This presence of ‘dilettante dreamers’ or ‘hobbyists’ (Parker & Belghitar, 2006; Reynolds, 2009; Reynolds & Curtin, 2008) in the sample is an issue to consider for all analysts, regardless of their research question.

The Person sub-stream helps underscore that even disregarding the low activity cases a random sample of business founders is numerically dominated by a *modest majority*. The founders are usually individuals or homophilous teams (Ruef et al., 2003) whose career reasons are not that different from those of other people (Carter et al., 2003). They typically prefer creating something small and manageable rather than pursuing maximum growth (Human & Matthews, 2004) and invest limited amounts of money in their start-ups (Kim et al., 2006; Reynolds, 2011). A minuscule proportion has venture capital funding and at these early stages only a distinct minority has even approached a bank (Cassar, 2009; Campbell & deNardi, 2009). At the same time as being a snapshot of the true nature of new venture creation this obviously has implications for what theories and research questions the data are suited for.

In addition to its modest majority nature, our review of the research also reveals the multi-dimensional *heterogeneity* of such a sample in terms of the characteristics of the founders and their ventures. This is reflected not least in the many different contrasts researchers make and find statistically significant differences for (see Appendix 1, Table A1). From a methods point of view it is particularly notable that founders with higher levels

¹ Research based on GEM is not included in our review as GEM data does not follow cases longitudinally on the micro-level.

of human and financial capital are likely to start higher ambition ventures but also have higher opportunity costs (Cassar, 2006; 2007; Petrova, forthcoming) suggesting a potential for confounding effects on outcomes (cf. Gimeno et al., 1997).

The Person sub-stream also highlights issues of *levels of analysis* (cf. Davidsson & Wiklund, 2001). First, the frequently used term *nascent entrepreneur* itself reflects a possible confusion of levels. With results showing that close to half of all NEs have previous business start-up experience (e.g., Kim et al., 2006) it is clearly the venture, and not necessarily the founder, that is ‘nascent’. Second, despite over 50 percent of NEs being members of a founding team rather than solo entrepreneurs (e.g., Davidsson & Honig, 2003) only two articles to date chose the team level of analysis.

In summary, from a methods perspective the Person sub-stream highlights issues about the sample: how its boundaries should be delineated; its multi-dimensional heterogeneity; its ‘modest majority’ dominance; the presence of relatively inactive ‘dilettante dreamers’, and the fact that it can alternatively be regarded as an individual-, team- or venture level sample. These issues have implications that extend to the Process and Outcomes sub-streams, which also add further method challenges.

5. Methods observations from the Process sub-stream

The Process sub-stream has added to the entrepreneurship literature a substantial number of articles representing systematic, large-scale study of new venture creation process issues, i.e., research questions previously not possible to address in broadly based research. While Figure 1 indicates that the number of articles in this sub-stream is somewhat smaller compared to the other two, it has received attention on par with those over the last five years.

The majority in the sub-stream (28 articles) addresses *exploitation* whereas only nine attend to *discovery*². The latter articles show that a relatively non-systematic search for opportunities, and processes triggered by a particular idea rather than by a pre-existing wish to become a founder-manager are more common than are systematic, textbook-like processes (Singh et al., 2008; Honig, 2001; cf. Gartner & Carter, 2003). In combination with results from other types of research (see, e.g., Henley, 2007) this underscores the immense importance of basing sampling of NEs and emerging firms on behavior – as the reviewed research does – rather than on intentions. However, those ventures resulting from systematic search may achieve better outcomes

² Following Davidsson, 2004, we associate ‘discovery’ with the conceptual side of venture creation – identification, refinement and elaboration of a business idea – whereas ‘exploitation’ refers to the tangible actions of resource acquisition, resource coordination and market making.

(Patel & Fiet, 2009), highlighting the importance of distinguishing between descriptive and prescriptive validity when studying a random sample.

The process articles rely heavily on a question package regarding the initiation and/or completion of up to 30+ *gestation activities* such as acquiring resources, developing a business plan, deciding on a location, creating a website, etc. (see Gartner et al., 2004a). For each affirmed activity the year and month of its occurrence is recorded. For each non-affirmed activity it is recorded whether the activity is considered irrelevant or a candidate for future implementation. Although these questions have proven very useful and versatile it is also clear that there is little agreement on what set of theoretical constructs these activities reflect or – among researchers applying the same theoretical abstractions – which activity goes with which theoretical construct (cf., e.g., Alsos & Kolvereid, 1998; Brush et al., 2008a, 2008b; Delmar & Shane, 2003; 2004; Tornikoski & Newbert, 2007). In addition, the trichotomous and one-off nature of these measures (done; not yet done; irrelevant) may sometimes be a severe limitation. For example, assessing the *time* devoted to each type of activity in a similar set, a direct forerunner to the PSED found that ventures that reached an operational stage devoted *18 times* more hours to certain types of activities (collectively called ‘setting up operations’) than did other start-ups (Gatewood et al., 1995). The design used in the articles we review is largely blind to this type of variance.

The most striking methods-related findings from the Process sub-stream is the extreme variability and complexity of venture creation processes, with gestation duration variance ranging at least from 1 month to 10 years (Reynolds & Miller, 1992) and showing little consistency in terms of the order in which various gestation activities are implemented (Liao et al., 2005). That is, the Process sub-stream highlights additional issues of *temporal heterogeneity*. This means that researchers taking on this topic face the operationalization issue ‘When does the process begin?’ (and end, which is also an Outcomes issue; see below). The variability of sequences suggests that no single activity is a reliable marker of initiation of the process. Some researchers use the date of the first activity. However, this creates problems akin to unduly influential outliers unless the sample is restricted to processes that are initiated relatively recently (e.g., Delmar & Shane, 2003; Lichtenstein et al., 2007) as some cases wait for several years before the start-up enters a more intense stage. As a practical, operational solution it has been suggested that the process be defined as initiated when for the first time two gestation activities are completed within the same 12 month period (Reynolds, 2007: 113).

The variance in process duration links to issues of *levels of analysis* and *sample definition*. In the Process sub-stream, 26 articles employ the *venture* level of analysis, as indicated by the dependent variable (the

articles are frequently not explicit about the choice of analysis level). This is problematic because the sampling mechanism over-samples venture creation processes of long duration as these are eligible for sampling over a longer time span (Henley, 2007). In addition, viewed in this way the sampling mechanism also over-samples ventures started by teams because each team member, as a potential respondent, increases the venture's sampling probability. The high proportion of spousal teams who supposedly share the same household reduces but far from eliminates this effect (Ruef et al., 2003). One implication is that already constituting a small group in PSED-type samples, the 'textbook like' teams that consist of multiple members with complementary competence (rather than relationships by blood and marriage) are actually over represented. As such teams are also likely to pursue higher ambition start-ups requiring more complex start-up processes they may be further over-sampled due to longer process duration (cf. above).

One remedy to the challenge of temporal heterogeneity is subgroup analysis. Results reported for subgroups indicate that there are systematic process differences at both individual- and venture levels of analysis (Alsos & Kolvereid, 1998; Liao & Welsch, 2008; Samuelsson & Davidsson, 2009). In addition, while it has so far proven very difficult to find general patterns in or explanations for the entire sequence of gestation activities there are examples of successful analyses which consider attainment of particular milestones, such as receiving external funding (Eckhardt et al., 2006).

In summary, the Process sub-stream has unveiled the vastly varying duration and composition of the process. This links to level of analysis issues which in turn imply problems with sample definition or sample bias. The 'modest majority' nature of the sample further means that unless related to predictors reflecting expertise (e.g., Alsos & Kolvereid, 1998) or to successful outcomes (cf. below) any observed process patterns are merely descriptively valid. The otherwise useful and versatile assessment of 'gestation activities' suffers from lack of consistent theoretical underpinnings.

6. Methods observations from the Outcomes sub-stream

Although much other management and entrepreneurship research shares the interest in and challenges of explaining business outcomes with sufficient validity (Brush & Vanderwerf, 1992; Carton & Hofer, 2006; Cooper, 1993; Richard et al., 2009) it is important to realize that the Outcomes sub-stream actually addresses a *new* research question: What drives the outcomes of the *start-up process itself*? For this purpose, researchers have employed the following outcome indicators:

1. The number or proportion of gestation activities completed between two points in time (10 articles)³.
2. Self-reported status of the venture as continuing (in terms of being either 'still trying' or 'operational') vs. having terminated (20 articles).
3. Self-reported status as being 'operational' vs. 'terminated' or 'either still trying or terminated' (15 articles).
4. A more objective definition of being 'operational' through a specific combination of criteria (3 articles)
5. The occurrence of first sales (5 articles).
6. The occurrence of the first instance of a period of positive cash-flow or profitability (5 articles).
7. Continuous measures of levels of sales (3 articles).
8. (Only) outcomes other than 1-7 (e.g., individual level outcomes) (4 articles)

All of 1-7 have shortcomings when interpreted as indicators of 'success', which is what they usually are. Categories 1 and 2 are arguably better conceptualized as 'making progress' and 'persistence', respectively, where the supposedly 'positive' outcome may alternatively reflect foolish (escalation of) commitment (Cialdini, 1988; McCarthy et al., 1993) rather than tenacity. Alternatively, in some cases termination may denote successful completion of a project that was always intended to have short duration. Category 3 suffers from being respondent-defined and may be unreliable. For example, Diochon et al. (2007b) show that a non-negligible proportion of cases self-assessed as operational in one wave are reported as 'still trying' (i.e., not yet operational or terminated) in the following wave, which may or may not reflect an actual regress in the venture's development. As criterion for being 'operational' Category 4 is preferable but given the enormous variability of start-up processes it is debatable whether researchers would ever agree on a specific 'right' set of start-up markers. As a case in point, the three reviewed articles using this type of measure all compute it differently (Newbert & Tornikoski, forthcoming; Rotefoss & Kolvereid, 2005; Tornikoski & Newbert, 2007). First sales (Category 5) frequently occur early in the process rather than being a late stage outcome (Carter et al., 1996). Category 6 is less problematic as cases that already have positive cash flow when first contacted are screened out, but the measure remains insensitive to variance in not-yet-recouped start-up costs. Category 7 is awkward from a distributional point of view as many cases have zeros on this indicator. In addition, levels of sales (or

³ We have accepted this as an outcome because of how it has been interpreted by authors applying it; however, we have classified articles using only the reaching of discrete, non-financial milestones as DV in the Process category.

profitability) can be argued to reflect firm performance after the start-up is completed rather than success in the start-up process as such.

With no 'ideal' outcome measure available the choice of DV becomes critical for the results and their interpretation. This can be exemplified with analyses of the effects of business planning, summarized in Table 1. The rightmost column indicates a moderately positive effect of business planning overall, much like what meta-analyses have concluded for established small firms (Brinckmann et al., 2010; Schwenk & Shrader, 1993). The evidence also seems mildly in favor of early planning and more comprehensive forms of planning. However, a closer inspection reveals that practically all of the positive results concern persistence or making progress; there is almost no support for positive planning effects with DVs that can be regarded stricter indicators of success. Collectively the results are thus more compatible with the interpretation that planning is associated with ventures pursuing processes that are more complex and of longer duration than with the conclusion that planning drives venture creation success.

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Insert Table 1 about here

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The *temporal heterogeneity* highlighted in the Process section adds to the challenge of interpreting outcomes. The vast differences in process duration mean that when sampled the ventures have unequal amounts of time and numbers of tasks left before they are fully operational. Consequently, when the outcome is assessed at a particular point in time it is very easy to confound process duration with outcome quality (e.g., judging cases 'more successful' just because they were already closer to completion when first sampled, or 'less successful' just because they have not *yet* achieved success).

As regards *levels of analysis* the sampling bias implied by choosing the venture level of analysis applies even more in the Outcomes category, where the venture level, applied by 41 articles, dominates. The inclusion of many start-up attempts that have already been in the gestation process for a long time not only makes the research more retrospective than intended, it may also bias results because shorter-duration cases from the same cohort, whose outcome drivers might differ, are excluded at screening as they have already achieved operational status or have been terminated. To further complicate issues, results have shown that process duration is correlated with both individual- and venture level characteristics (e.g. Alsos & Kolvereid, 1998; Samuelsson & Davidsson, 2009).

In addition, it is not uncommon that researchers relate individual level IVs (pertaining only to the respondent) to venture outcomes while including both solo- and team start-ups in the analysis. In such cases the characteristics and resources represented by other team members become a source of unobserved heterogeneity (e.g., Shugan, 2006). Conversely, when all team members' resources are considered they are frequently assessed as *resource endowments* with the implicit assumption that these resources are automatically at the venture's disposal and thus employed. This may not be the case, as the research has demonstrated that a large number of founders are involved in other ventures at the same time (e.g., Kim et al., 2006). Consequently, analyses using direct measures of *resource investments* have demonstrated stronger effects (Brush et al., 2008a; cf. Reynolds, 2007; Townsend et al., 2010).

All these complications suggest researchers need to apply great care and sophistication in their modeling and analysis work. This can be exemplified by Table 2, which compiles all analyses regarding the influence of Human Capital (HC) on venture creation process outcomes.

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Insert Table 2 About here

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Overall, the results seem to suggest that HC has little or no effect on outcomes. However, a closer examination of the studies behind the table entries strongly suggests that those that have paid attention to level issues and looked beyond general, direct and linear effects are much more likely to yield credible evidence of effects on performance. As regards the first issue, the positive results for education were obtained with non-linear specifications (US) or for innovative ventures only (Sweden). The positive effect of management experience in the Dutch data refers to 'high ambition' ventures only. In the same study, the positive effect of prior start-up experience appeared only for those lacking in other forms of experience. For both Sweden and the US this positive effect mostly appears in analyses where the entire team's experience is considered, suggesting many non-results may be due to levels mix-ups. The Norwegian results for start-up experience suggest that portfolio- but not serial entrepreneurs outperform novices. Further, those with prior successful experience (but not those with prior unsuccessful experience) are more successful at the next attempt as well, suggesting that mere experience is not an ideal proxy for expertise. The positive effects of industry experience in Table 2 emerge when the effect of respondent experience was estimated for solo founders only (US) consistent with individual level analysis, or when the experience was assessed across all team members, consistent with venture level analysis (Sweden).

In summary, the previously identified issues of the modest majority dominated but heterogeneous sample, temporal variability and levels-of-analysis all affect work directed at explanations of outcomes as well. In addition, the research is challenged by the problem of correctly assessing and interpreting outcomes. This all implies that a high degree of sophistication is required in modeling, analysis and interpretation, including consideration for biasing sample attrition and outcomes being attained at variable points in time. In the following section we will assess the extent to which the research published so far has met these requirements.

7. A critical assessment of the utilization of method advantages and method issues remedies

Our review of the three sub-streams individually unveiled a number of partly interrelated issues pertaining to *sample definition and representativeness*; *levels of analysis*; various forms of *heterogeneity*, and *operationalizations*. In this section we examine the extent to which the published articles actively deal with these problems, as well as the extent to which they utilize the longitudinal design, which is one of the presumed advantages of the PSED approach.

The first column in Table 3 reflects whether any type of correction was employed to reduce sample biases. It turns out that only one fourth of the articles did so. However, the meager results for the Person category are exaggerated (and therefore put within parentheses) because we have not included application of sampling weights that are specific to the original PSED study (see <http://www.psed.isr.umich.edu/psed/data>)⁴. These weights do not correct for venture level sampling biases and thus do not provide sufficient correction for most articles in the Process and Outcomes streams. This considered, it may be argued that lack of sample correction is a greater limitation for the latter categories, which frequently apply a venture level logic and use the longitudinal data (see Table 4). There are few examples of correcting for over sampling of start-ups with long start-up processes or for non-random sample attrition, and no articles correct for over sampling of teams.

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Insert Table 3 about here

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Heterogeneity can be dealt with in several, complementary ways. The second column in Table 3 reflects whether or not the work controls for at least two of the following four issues: a) the human capital of the founders; b) the financial capital of the founders; c) the type of venture (incl. industry); and d) the initial stage of development of the venture. These controls are particularly critical as they are associated with start-up processes

⁴ Neither did we code for the use and the use of the ‘KSCLEANS’ program for eliminating cases with inconsistent data in PSED (see <http://shaverk.people.cofc.edu>).

of varying complexity and duration, creating risks for misinterpreting outcomes assessed at a particular time. While their use is the highest within the Outcomes category, where they are arguably most important, the result can hardly be judged satisfactory since asking for just *some* control of *two out of four* critical issues is a rather lenient criterion. The problem of causal heterogeneity – the same IV having different effects for different parts of the sample (Western, 1998) – is not solved with control variables but can be addressed through *sub-sample comparison* (Col. 3) or *moderation/mediation* (Col.4). The former is the very nature of much of the research in the Person category, so the high level there is hardly surprising. Again, the data suggest that these remedies for heterogeneity problems in the Process and Outcomes categories are underutilized.

The problem that the interpretation of outcome indicators is uncertain can be reduced by examining *multiple DVs* (Col. 5). A slight majority of studies employ this practice. However, a clear deficiency is that the instance of use of multiple DVs is lowest in the Outcomes category, where it is arguably the most important.

Column 6 reflects the use of any type of multi- or cross-level design, as assessed by comparing the level at which IVs and DVs are assessed. Column 7 focuses on one particular type of cross-level design, namely where individual level IVs are used as predictors of venture level DVs without controls for team level characteristics. This criterion does not really apply to the Person level where the relevant DV is individual level by definition (hence results are displayed within parentheses). Although Column 6 may include sophisticated and well conducted analyses, Column 7 almost invariably reflects a problem of unobserved heterogeneity – the resources and motivations of other team members – threatening to bias results. Hence, a high value in this sample is negative. The results show that cross-level analyses are common and often of a problematic nature, with one third of all articles fulfilling the ‘cross-level 2’ criterion. This is but one (albeit the most frequent) of several possible cross-level designs that are methodologically problematic.

Reflecting differential effects depending on the initial level of the predictor, non-linearity can be considered another type of causal heterogeneity. The last column of Table 3 shows that non-linear specifications are relatively infrequent and applied to an equally small extent in each of the three sub-streams. In these data we have only included non-linear specifications that appear theorized and not those that appear to be non-reflected consequences of variable transformations or choice of analysis method.

Table 4 reveals the extent of use of the longitudinal potential in the data. The first column reports the average number of waves of data used while the second column reflects the basic criterion for causal analysis that there is time separation between IVs and DVs. Columns 3 and 4 state whether data for the same IV and DV, respectively, from different waves were used, which can be of major help in dealing with temporal

heterogeneity. The last column reports whether another (than data wave) type of time-specific information was used, namely the ‘time stamps’ associated with gestation activities that were initiated or completed.

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Insert Table 4 about here

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The most striking result in Table 4 is that the Person sub-stream does not make much use of the longitudinal information at all. A check revealed that this is *not* due to researchers focusing on Person issues at the early stages of their project, while waiting for the longitudinal data to be available in future waves. Neither can limited use of longitudinal data by researchers with individual level interests be dismissed as merely a reflection of the design of PSED-type studies or of our classification scheme, as only four articles in the Outcome sub-stream focus on individual level DVs (cf. above). This said, for comparison between NEs and others, or between different NE types, the design advantages for the Person stream undoubtedly pertain to representativeness and reduced risks of reverse causality, survivor bias, and retrospection bias. However, as the cases are already in the process when sampled – and sometimes have been so for a long time – these advantages may not be as strong as initially intended, and we have also noted that novel findings from the Person sub-stream do not seem related to these method advantages.

The use of longitudinal information is disappointingly low also for the Process sub-stream. In particular, it is surprising that a majority of the ‘process only’ do not fulfill the basic criterion of IV-DV time separation and that they have not made explicit use of the gestation activity time stamp information. Only for the Outcomes category does the use of longitudinal and time specific information reach high levels. However, it should be noted that the criterion of use of the same IV or DV from several waves is fulfilled only by about half of the studies in the sub-stream and that even this figure is inflated because in many cases this amounts only to collapsing information from different waves into the same variable. Few articles examine time-varying effects of IVs or time-varying effects on DVs.

To sum up, the early stage study of large samples of nascent entrepreneurs and emerging ventures is a novel and very challenging task, which researchers should be lauded for taking on at all. The critical examination in Table 3 and Table 4 suggest that many of the attempts to take on this challenge have not made full use of the potential of the data or applied to a satisfactory extent the available remedies that can make the challenge more manageable. This does not mean that the nascent entrepreneurship research stream is devoid of

good examples of handling these challenges. We briefly present some exemplars in Appendix 3. This said, there is certainly room – and need – for improvement along the lines we suggest below.

8. Opportunities for further development

Our critical review of the pioneering work that has been undertaken in this line of research allows us to identify possible further improvements to research of this kind. Consistent with the main themes that emerged from our analysis we present a shorthand version of our advice in Table 5 under the headings *Choice of research questions; Level of analysis; Sample issues; Conceptualization and operationalization, Dealing with heterogeneity* and *Using longitudinal data*. Below we provide some further elaboration.

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Insert Table 5 about here!

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8.1 Choice of research questions

The Person sub-stream as a whole has yielded relatively few new or interesting findings that are specifically attributable to the design advantages of PSED-type research. While the early stage capture remains a strength for those pursuing ‘Who?’ questions, future research may benefit from *focusing on process and outcome questions*, thereby capitalizing more on the unique research design. Alternatively, those interested in the front end of the process may note the limited interest shown so far in *explaining variance in the ‘opportunity’ or ‘venture [idea]’* (cf. Samuelsson & Davidsson, 2009; Shane & Venkataraman, 2000). For those whose interest is genuinely in the individual(s) there is clearly room for more contributions focusing on *team issues*. For this purpose the publicly available PSED II data set is an excellent data source.

As entrepreneurial nascence is transient and a rather large minority of all individuals are involved in a business start-up at some point in their lives (Delmar & Davidsson, 2000), comparing NEs to others is somewhat akin to comparing holiday makers with the general population, parts of which, obviously, will be on vacation next week (Davidsson, 2006). This suggests that turning the research question around and studying *individual level process outcomes*, i.e., ‘What does being involved in a start-up process do to people?’ is a worthwhile idea. To this end, articles by Gavin Cassar may serve as inspiration (Cassar, 2010; Cassar & Craig, 2009).

Extant data sets can address all of these suggested research areas to some extent. Designers of new projects obviously have full freedom to include additional contents that can deepen these and other lines of inquiry, starting from theoretical propositions which in turn drive operationalizations and analyses.

8.2 Level of analysis

On this issue the advice for researchers could not be clearer: *be explicit and consistent about the choice of level(s) of analysis* (cf. Davidsson & Wiklund, 2001; Kozlowski & Klein, 2000; Rousseau, 1985). Our review clearly demonstrates that this is not as ‘obvious’ an issue as one might think, which in turn is likely due to the emerging stage and longitudinal design uncovering new challenges in this regard, especially as regards the relationships between the focal venture and the sampled respondent. Consistent application of a chosen level of analysis requires that *variables be operationalized on the chosen level* (Dimov, 2010) and/or *explicit modeling of separate effects of (or on) different levels* (Eckhardt et al., 2006). Further, it calls for *distinguishing between discontinuation of the respondent’s participation in a continuing venture, and discontinuation of the venture itself* (which can be regarded either as problem of sample definition or of operationalization of the outcome, cf. below). While most extant data sets have a weakness in this latter regard as well as in terms of availability of team- or venture level data for certain types of IVs, they do allow for sensible handling of levels issues by careful analysts. Future projects can implement a consistent level throughout the research. If the choice is team- or venture level, a second respondent may be sought for all team-based start-ups or at least in cases where the original respondent resigns from a continuing start-up.

As we have noted above the ways in which the *sample needs to be restricted or weighted* varies by level of analysis. The task is relatively more challenging for venture level analysis, and addressing certain combinations of topics (e.g., intersections D, E and G in Figure 1) may subject the researcher to incompatible demands in this regard. However, perfect statistical representation of the empirical population in a given country at a given point in time is not always the most critical issue. For example, although the over-sampling of (in particular large and non-spousal) teams is a serious issue when trying to find out the relative prevalence of different types of teams, a far more important issue for certain test of theoretical relationships may be to analyze spousal teams separately (Ruef et al., 2003).

8.3 Sample issues

As the methods issues we discuss are intertwined we had reason to mention the varying need for sample restriction and weighting above. In addition to this, future research ought to pay more attention to *correction for non-random respondent attrition* over time (Delmar & Shane, 2006; Parker & Belghitar, 2006). A more fundamental sampling issue is the *modest majority dominance*. While their large numbers suggest that the ‘modest majority’ is an important force in the economy their numbers do not necessarily justify giving them greater weight in tests of theoretical relationships. To put it differently, they may not adequately represent the phenomenon some of the theories used were designed to explain, such as the creation of ‘organizations’ (Gartner & Carter, 2003) or ‘entrepreneurship’ as conceived by Shane and Venkataraman (2000). This problem is further aggravated by the presence of a non-negligible sub-set of cases that show low levels of activity and tend to remain inconclusive for a very long time (Parker & Belghitar, 2006; Reynolds, 2007; Reynolds & Curtin, 2008).

Restricting venture level analyses to *recently initiated cases* (Delmar & Shane, 2003; Lichtenstein et al., 2007) in order to reduce venture level sample bias automatically also limits the number of low-activity cases. Users of extant data sets can also deal with these problems by trying to *exclude ‘low activity’ cases* by some criterion based on gestation activities per time unit; *perform sub-sample analyses* where the ‘high potential’ cases are treated separately (Liao & Welsch, 2008; Newbert, 2005; Reynolds & Curtin, 2008; Samuelsson & Davidsson, 2009); *perform complementary analyses (both with and) without the ‘still trying’ category* (Lichtenstein et al., 2007; van Gelderen et al, 2005), and *pool data sets* (e.g. from different countries) in order to get a large enough ‘higher potential’ category for separate analysis. If nothing else, users of extant data sets should *avoid major theory-data mismatches* like theorizing with high-powered, growth-orientated and innovative ventures in mind while testing the theory on a ‘modest majority’ sample.

While the nature of the phenomenon makes any type of pre-stratification difficult, designers of new data sets may *start with an even larger sample* in order to also make the ‘high end’ bigger. They may also try *more restricted or directed random sampling* among, e.g., university alumni; individuals with particular educational or career backgrounds, or those who reside in certain types of locations, in order to increase the proportion of ‘high potential’ ventures. For theory-testing purposes there may even be reason to *abandon ambitions of randomness* and generate an early stage, ‘high potential’ judgment sample of start-ups from all types of individuals or organizations (e.g., research labs; patent attorneys; business angels; social networking sites) that may be in contact with emerging ventures of this kind. Using a combination of all available sources would arguably reduce specific biases associated with a particular source. The fact that the basic characteristics

of a randomly sampled NE population have already been mapped out (Delmar & Davidsson, 2000; Reynolds et al., 2004) and that technological developments make representative sampling through random digit dialing ever more challenging anyway (Carley-Baxter et al., 2010) also points in this direction. We should caution, however, that any sampling method that relies on the founders' social connectedness is likely to introduce biases, as social capital has itself been pointed out as an important success factor (Davidsson & Honig, 2003).

The nature of the sample can also be accepted as is under the mottos 'theorize what you study' and 'see opportunity where others see problems'. The large number of 'modest' venture start-ups clearly represents an economically and socially important phenomenon. The theories and data used so far in PSED-type research perform comparatively poorly for explaining outcomes among this category relative to explanatory power for innovative or higher-tech ventures (Newbert, 2005; Samuelsson & Davidsson, 2009). Thus there is obvious need for *better theorizing and modeling* of the drivers of successful establishment of imitative, subsistence-orientated businesses. While new data collection may be needed in order to do this to full satisfaction, existing data may have more to offer than what has been effectively utilized so far. Even the presence of low-activity, 'dilettante dreamers' (Parker & Belghitar, 2006) is a phenomenon worthy of serious scholarly attention. What type of people exhibit this behavior? Why? Does it have the same antecedents as (other aspects of) 'social desirability' (Roth et al., 1986) or are completely different explanations needed? Does the propensity to 'over report' NE status vary by country or culture? (If so, this would have somewhat serious consequences for certain types of GEM-based research; cf. Bergmann et al., 2009; Reynolds et al., 2005.)

8.4 Conceptualization and operationalization

The issue of how 'nascent entrepreneur' and 'nascent venture' should be operationalized coincides with the sampling issue (cf. above) of determining what cases are eligible for inclusion. The sampling mechanism has been gradually refined over time (Reynolds, 2009). Designers of future projects may want to continue that work with a venture level focus and/or with the aim of finding better ways to exclude low activity cases without screening out those that are theoretically valid. Users of extant data can use information from the comprehensive interviews to further restrict their samples according to their particular needs.

While assessment of resources is not unique to this stream of research we note that using measures of *resource investments in the venture* rather than resource endowments of the respondent overcomes certain levels mix-up issues and typically leads to stronger results. Users of extant data sets have some, albeit limited options in this regard while designers of new projects can apply this advice throughout.

For process research the time-stamped gestation activity questions have proven invaluable as individual or collective IVs, DVs, controls, or as a means of reorganizing the data set according to the ventures' own timeline. However, users of extant data sets can apply *stronger conceptualization* of groups of gestation activities. In doing so, they may want to be somewhat more selective in which to include as all activities are not necessarily equally important. Neither do they all necessarily represent 'activities' or 'behaviors' under the founders' full control. Future users of current data sets can also *make use of the respondents' assessment of activities as relevant or not* to their venture. Peculiarly, only one author team has used this information (Newbert & Tornikoski, forthcoming; Tornikoski & Newbert, 2007). Future projects can make further improvements by *starting from a strong conceptualization; making the assessment more quantitative and continuous* (e.g., in terms of time devoted to – or relative importance of – each type of activity at each stage of the process) and by *employing new technologies for more frequent data collection*, increasing temporal precision and further reducing retrospection bias (cf. Uy et al., 2010).

Our analysis suggests that researchers need to apply considerable care in interpreting outcomes. Several strategies may be needed. One is to *select stricter indicators of success*. We argue that using a researcher-defined combination of achieved milestones (Rotefoss & Kolvereid, 2005) is preferable to the respondent's self-report of the venture's status as 'operational'. Similarly, we argue that the attainment of a substantial period of positive cash-flow or profitability is preferable to, e.g., reaching first sales. Designers of future studies may want to further improve on 'success' measurement. We would recommend inclusion of a measure reflecting whether the start-up has recovered all its start-up costs as indicator of start-up success. With a less demanding criterion it is not known whether the continued work on the start-up represents better performance or resource destruction. Conversely, spectacular profit or loss beyond the break-even point is arguably no longer a matter of start-up performance but effects of strategy (or luck) in managing an established business. Given the heterogeneous nature of the sample – which also implies different goals – there is also reason to assess absolute performance in relation to the founders own goals rather than in relation to other ventures (Venkataraman, 1997).

The latter should preferably be part of another strategy to deal with the problem of adequate outcome assessment, namely to *use multiple DVs* and carefully examine the differences in results. This can be especially valuable if the indicators can be suspected to differentially reflect persistence, progress, success, and process duration. The important task of avoiding confounding of the latter two can be further facilitated by *analyzing effects on the same DV at different points in time*. Inspiration for development of more adequate outcome

measures may be sought in the project management literature, which has also struggled with problems like heterogeneous goals and the associated limitations of universal outcome criteria; variance in duration, and different drivers of outcomes at different stages of development (Atkinson, 1999; De Wit, 1988; Pinto & Prescott, 1988).

Finally, a very important alternative strategy is not only to accept but also take an interest in the fact that the outcome indicators used so far likely represent different phenomena and therefore to *theorize differential drivers of persistence, progress, and success* in venture start-up processes. *Engagement* – i.e., the ‘Person’ question – can be added to the list. Some reviewed articles make suggestive comparisons (e.g., Davidsson & Honig, 2003; Rotefoss & Kolvereid, 2005) but stop short of *theorizing* differential effects. Other research has made some progress in distinguishing theoretically between drivers of persistence and success (e.g. Cooper et al., 1994; DeTienne et al., 2008), which can serve as further inspiration for PSED-type work along the suggested lines.

8.5 Dealing with heterogeneity

How does one effectively theorize and test causal relationships when very different individuals try to start very different types of venture for different reasons and at varying pace? While all research relying on non-experimental data struggle with heterogeneity issues it can be argued that they are particularly challenging for the reviewed line of research. First, the phenomenon itself may be more heterogeneous as it concerns emerging ventures. In more mature stages of development, market forces (Lawless & Tegarden, 1991), learning (Jovanovic, 1982) and institutional pressures (Honig & Karlsson, 2004) tend to limit the range of variation. Second, the longitudinal nature of the research in combination with extreme variability in process duration adds temporal heterogeneity that is not present in much other research. Apart from sampling restrictions, a basic way of dealing with heterogeneity problems is to *include well selected control variables*. The need for specific controls vary with the research question but our review has suggested *venture type*, and *financial and human capital of the founders* are critical as they affect process complexity and duration (Newbert, 2005; Liao & Welsch, 2008; Samuelsson & Davidsson, 2009) as well as what outcomes are aimed for and judged acceptable enough to warrant continuation (Cassar, 2006; Gimeno et al., 1997; Petrova, forthcoming). Further, it is important to control for initial stage of development. Here, the experience is that the number of gestation activities already completed is a more effective control than is mere time in the process (see, e.g., Dimov, 2010).

Control variables do not address causal heterogeneity. Therefore, the suggested controls above should be among the first suspects in researchers efforts into *theorizing and modeling differential effects for different parts of the total sample* through sub-sample analyses; various techniques for analyzing moderation and mediation, and careful examination of non-linear relationships. To model temporal (causal) heterogeneity it may be necessary to *apply adapted analysis strategies and techniques* which explicitly model differences both in initial stage and in progress over time (Delmar & Shane, 2003; Samuelsson & Davidsson, 2009). Designers of future projects may also want to consider reducing heterogeneity from the very start by drawing a much more narrowly defined sample in terms of type of venture; type of founders, or exact stage of development at the point of first contact. This will never be an easy or even fully achievable task at very early stages of development, and it is unlikely to be attainable at all with continued ambitions for random sampling. However, as noted above in relation to ‘modest majority’ vs. ‘high potential’ focus, for theory-testing purposes a more homogeneous judgment sample may sometimes be preferable or at least a valuable complement to a random sample.

8.6 Using longitudinal data

Due to the interrelatedness of methods issues we have already touched upon longitudinal issues pertaining to this specific research stream above. Thus, it should suffice here to quickly reiterate that *IV-DV time separation* can be achieved both via waves of data collection and through gestation activity time stamps (e.g., for securing that ‘first sales’ occurs after its theorized predictors); that analyzing *the effects of the same IVs assessed at different times and/or on the same DV assessed at different times* is a hitherto under-utilized opportunity (e.g. for reducing risks of confounding drivers of process duration with drivers of ultimate success), and that *more attention to attrition bias* is called for. In order to not end up with too small a sample due to attrition over time researchers may want to apply state-of-the art data imputation techniques in order not to lose many cases due to item non-response (Fichman & Cummings, 2003; Newman, 2003). In addition, new projects may extend the time horizon of the project even further (to reduce censoring of eventual outcomes) and use new technologies to collect data at shorter intervals, further reducing retrospection bias and increasing time specificity.

9. Conclusion

The PSED approach is a research innovation that has made it practically possible to address core issues for entrepreneurship research – processes of creation of new business ventures as well as their antecedents and outcomes – in large samples that are followed over time. With new approaches follow new method challenges, or new manifestations of what constitutes ‘good research practice’. Although the research stream has undoubtedly yielded important new findings our review has revealed that much of the research to date has not made use of the full potential of this new approach and not adequately managed the particular methods challenges with which it is associated. We draw this conclusion acknowledging that the authors behind the reviewed articles have done important, pioneering work and that it is only thanks to their efforts that we are in a position to identify and suggest solutions to the methods issues we have discussed above.

Despite the extensive work carried out so far there are still many central research questions that await satisfactory answers and which can be fruitfully addressed through survey research building on early capturing and real time following of on-going venture creation processes. At a time when several ‘second generation’ PSED-type studies are under way or being planned (see, e.g., Reynolds & Curtin, 2011) it is our hope that this review will assist future research in selecting the most promising research questions, matching theories with the phenomena captured by the data, and applying adequate remedies to the particular methods challenges at hand.

10. References

* = one of the 83 journal articles included in the review.

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FIGURE 1

Topical focus of the reviewed articles

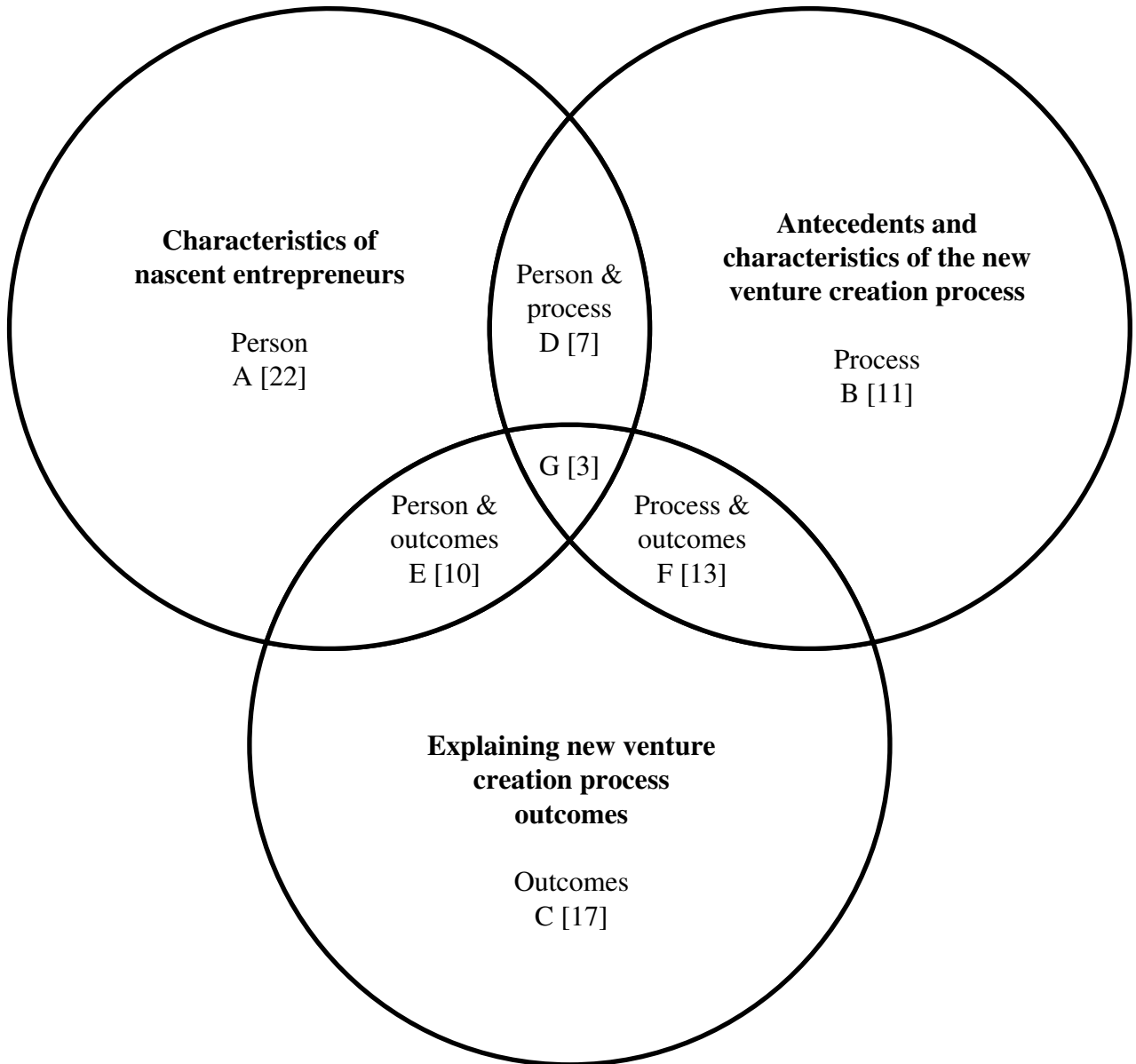


TABLE 1

Summary of findings on business planning effects by planning measure and outcome

| <i>Business plan measure</i> | <i>Outcome measure and effect^a</i> | | | Continuation vs. non-continuation ^{c,d,1,4,5,6,7,8,} | | | Reaching first sales ^{3,9} | | | Operational vs. terminated ^{c,10} | | | Operational vs. any other status ^{c,3,5,6,11} | | | Reaching profitability ⁶ | | | Total | | |
|---|---|-----|-----|---|---|---|-------------------------------------|-----|-----|--|-----|-----|--|-----|-----|-------------------------------------|-----|-----|-------|----|---|
| | Making Progress ^{b,1,2,3} | | | | | | | | | | | | | | | | | | | | |
| | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - |
| Completed business plan of any form | 9 | 6 | 0 | 4 | 5 | 0 | 0 | 5 | 0 | 2 | 4 | 1 | 0 | 3 | 0 | 0 | 1 | 0 | 14 | 23 | 1 |
| Composite measure of extent of planning | 2 | 0 | 0 | 2 | 2 | 0 | n/a | n/a | n/a | n/a | n/a | n/a | 0 | 4 | 0 | n/a | n/a | n/a | 3 | 5 | 0 |
| Sequence measure of early planning | n/a | n/a | n/a | 3 | 3 | 0 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 2 | 2 | 0 |

Note: The same work may report multiple models; the table summarizes all reported multivariate findings. a) + denotes a sig. positive effect (p<.05) ; 0 denotes no significant effect; - denotes a sig. negative effect (p<.05); b) completion of particular gestation activities other than financial milestones, or accumulation of completed activities; c) based on self-perceived venture status in follow-up interviews; d) some analyses performed as terminated vs. all other outcomes have been reversed. 1) Delmar and Shane (2003; 2004) [SE]; 2) Eckhardt et al. (2006) [SE]; 3) Tornikoski and Newbert (2007) [US]; 4) Brush et al. (2004) [US]; 5) Dimov (2010) [US]; 6) Honig and Karlsson (2004) [SE]; 7) Liao and Gartner (2006; 2007) [US]; 8) Parker & Belghitar (2006) [US]; 9) Newbert (2005) [US]; 10) van Gelderen et al. (2005; 2011) [NL]; 11) Edelman et al. (2008) [US].

TABLE 2

Summary of findings on outcome effects of human capital by country

| <i>Human capital indicator</i> | <i>Study and effect^a</i> | | | | | | | | | | | | | | | | | |
|--|-------------------------------------|-----|-----|---------------------------|-----|-----|--------------------------------|-----|-----|---------------------------|-----|-----|---------------------------|-----|-----|--------------|----|----|
| | <i>US^b</i> | | | <i>Canada^c</i> | | | <i>Netherlands^d</i> | | | <i>Norway^d</i> | | | <i>Sweden^e</i> | | | <i>Total</i> | | |
| | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - | + | 0 | - |
| <i>General human capital^f</i> | | | | | | | | | | | | | | | | | | |
| Education | 7 | 46 | 1 | 0 | 1 | 0 | 0 | 7 | 0 | 0 | 1 | 0 | 1 | 9 | 0 | 8 | 64 | 1 |
| Work experience | 0 | 23 | 1 | 0 | 1 | 0 | 0 | 5 | 0 | n/a | n/a | n/a | 0 | 6 | 0 | 0 | 35 | 1 |
| Team vs. Solo/Team size | 1 | 21 | 0 | n/a | n/a | n/a | 0 | 8 | 0 | n/a | n/a | n/a | 3 | 10 | 3 | 4 | 39 | 3 |
| (Age) | 6 | 36 | 1 | n/a | n/a | n/a | 0 | 4 | 1 | 1 | 0 | 0 | 1 | 13 | 1 | 8 | 53 | 3 |
| (Gender - female) | 4 | 45 | 0 | 2 | 2 | 0 | 0 | 5 | 0 | 0 | 3 | 0 | 1 | 5 | 0 | 7 | 60 | 0 |
| (Ethnic minority status) | 0 | 11 | 11 | n/a | n/a | n/a | n/a | n/a | n/a | 0 | 1 | 0 | n/a | n/a | n/a | 0 | 12 | 11 |
| <i>Specific human capital</i> | | | | | | | | | | | | | | | | | | |
| Management experience | 5 | 16 | 5 | n/a | n/a | n/a | 1 | 4 | 0 | n/a | n/a | n/a | 1 | 5 | 0 | 7 | 25 | 5 |
| Industry experience | 9 | 17 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | n/a | n/a | n/a | 4 | 19 | 0 | 13 | 42 | 0 |
| Start-up experience | 6 | 25 | 4 | 0 | 2 | 0 | 1 | 6 | 0 | 4 | 2 | 1 | 15 | 13 | 2 | 26 | 48 | 7 |
| Business or start-up classes | 0 | 7 | 0 | 0 | 2 | 0 | n/a | n/a | n/a | n/a | n/a | n/a | 2 | 4 | 0 | 2 | 13 | 0 |
| Other | n/a | n/a | n/a | 2 | 0 | 0 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 2 | 0 | 0 |

Note: Entries across countries represent independent tests whereas entries within country columns are based on the same data set (except for the US where different data sets have been developed although most analyses refer to the original PSED). Thus, the table is a combined test of robustness across samples and model specifications. a) + denotes a sig. positive effect; 0 denotes no significant effect; - denotes a sig. negative effect ($p < .05$); b) based on Brush et al. (2008a; 2008b); Cassar and Friedman (2009); Dimov (2010); Edelman et al. (2008); Liao and Gartner (2006; 2007); Liao et al. (2008); Lichtenstein et al. (2007); Newbert (2005); Newbert & Tornikoski, forthcoming; Parker & Belghitar (2006); Petrova, forthcoming; Tornikoski and Newbert (2007); Townsend et al (2010); c) based on Diochon et al. (2005a); Menzies et al. (2006); d) based on van Gelderen et al. (2005; 2011); e) based on Alsos and Kolvereid (1998); Alsos and Ljunggren (1998); Rotefoss and Kolvereid (2005); e) based on Davidsson and Honig (2003); Delmar and Shane (2003; 2004; 2006); Honig and Karlsson (2004); Eckhardt et al. (2006); Samuelsson and Davidsson (2009); Shane and Delmar (2004); f) We have reluctantly (hence the parentheses) followed the practice of including age, gender and ethnicity among the indicators of general Human Capital.

TABLE 3

Indicators of methodological sophistication (proportion of articles using)

| <i>Criterion Article category</i> | Sample correction | 2+ Specific controls | Sub-sample comparison | Moderation and/or mediation | Multiple DVs | Cross- level 1 | Cross- level 2 | Non- linearity |
|---------------------------------------|----------------------|----------------------------|--------------------------|-----------------------------------|-----------------|-------------------|-------------------|-------------------|
| Person only | (9%) | 36% | 77% | 32% | 50% | 27% | (5%) | 14% |
| Process only | 27% | 27% | 36% | 27% | 55% | 82% | 36% | 0% |
| Outcomes only | 41% | 71% | 18% | 25% | 29% | 59% | 29% | 15% |
| All Person | (10%) | 38% | 69% | 36% | 62% | 55% | (31%) | 12% |
| All Process | 24% | 38% | 50% | 38% | 53% | 56% | 44% | 12% |
| All Outcomes | 49% | 49% | 26% | 30% | 51% | 74% | 42% | 14% |
| All articles | 25% | 43% | 47% | 31% | 52% | 63% | 33% | 12% |

Note: For numbers of articles in each category see Figure 1. Person only = A; Process only = B; Outcomes only = C; All Person = A, D, E, G; All Process = B, D, F, G; All Outcomes = C, E, F, G; All articles = A – G. ‘2+ Specific controls’ = use of at least two of the following as control variables: founder wealth; founder human capital; venture type; stage of development. ‘Cross-level 1’ = any cross- or multi-level specification; ‘Cross-level 2’ = Individual level IV with venture level DV without team level controls.

TABLE 4

Use of longitudinal and time specific data (proportion using unless otherwise stated)

| <i>Criterion Article category</i> | # Waves (mean) | Time separ. IV-DV | Same IV at diff. times? | Same DV at diff. times? | Use of gest. activity time stamp info? |
|---------------------------------------|-------------------|----------------------|----------------------------|----------------------------|---|
| Person only | 1.27 | 5% | 0% | 5% | 0% |
| Process only | 2.45 | 36% | 18% | 18% | 45% |
| Outcomes only | 3.23 | 94% | 59% | 47% | 71% |
| All Person | 1.98 | 31% | 7% | 21% | 10% |
| All Process | 2.56 | 53% | 26% | 35% | 35% |
| All Outcomes | 3.37 | 91% | 47% | 53% | 44% |
| All articles | 2.49 | 53% | 27% | 34% | 30% |

Note: For numbers of articles in each category see Figure 1. Person only = A; Process only = B; Outcomes only = C; All Person = A, D, E, G; All Process = B, D, F, G; All Outcomes = C, E, F, G; All articles = A – G.

TABLE 5

Summary of advice for users of existing data sets and designers of new projects

| Category Issue | <i>Users of existing data sets should consider...</i> | <i>Designers of new data sets may in addition want to consider...</i> |
|---|--|--|
| <i>Choice of research question</i> | <ul style="list-style-type: none"> • A focus on Process or Outcomes rather than Person, or • If Person, focusing on team issues or individual level process outcomes • Explaining variance in the 'Opportunity' | <ul style="list-style-type: none"> • All that is suggested to the left, with greater freedom to design the project accordingly • Pursuing yet other research questions and develop contents accordingly |
| <i>Level of Analysis Issues</i> | <ul style="list-style-type: none"> • Being explicit about the choice of level(s) of analysis • Making sure theory, sample restriction and operationalizations are aligned with the chosen level(s) • Explicitly modeling differential effects of or on variables on different levels • Applying the under studied team level of analysis | <ul style="list-style-type: none"> • Designing the project with (a) given level(s) in mind, from sampling to analysis. • Using multiple respondents for team start-ups • Including more team- and individual level outcomes |
| <i>Sample issues</i> | <ul style="list-style-type: none"> • Restricting or weighing the sample in accordance with the chosen level of analysis • Dealing with 'modest majority' and 'low activity cases' through sample restriction; sub-group analysis; pooling data sets, and better theorizing of the phenomena actually captured by the research • Checking and correcting for initial non-response and non-random respondent attrition | <ul style="list-style-type: none"> • Further refining screener mechanism and adapt it to the chosen level of analysis • Starting with an even larger sample • Applying the 'early capture + longitudinal follow-up' approach to more narrowly defined, random or non-random samples • Dealing with sample representativeness issues triggered by new technology usage patterns (e.g. diminishing landline coverage) |
| <i>Conceptualization and Operationalization</i> | <ul style="list-style-type: none"> • Restricting the sample for improved delineation of 'nascent entrepreneur' or 'nascent venture' • Using indicators of resource investments in the venture rather than of respondent's resource endowments • Applying stronger conceptualization and greater selectivity when using <i>gestation activity</i> variables • Using the judged (ir)relevance of each gestation activity • Selecting stricter indicators of success • Using multiple DVs or the same DV at different times • Theorizing differential drivers of engagement, persistence, progress and success in venture creation | <ul style="list-style-type: none"> • Further refining the screener mechanism and adapt it to the chosen level of analysis • Developing better measures of resource investments in the venture • Developing better theorized and more continuous measures of gestation activities • Developing improved indicators of 'start-up process success' (and other outcomes) on the venture level, including good measures of absolute, subjective performance • Including more outcome measures on individual- and team levels |
| <i>Dealing with heterogeneity</i> | <ul style="list-style-type: none"> • Including carefully considered control variables, especially for founder wealth and human capital; type of venture, and initial stage of development • Theorizing and modeling causal heterogeneity through sub-sample-; moderator- and mediator analyses as well as non-linear specifications • Applying analysis techniques designed to handle temporal heterogeneity | <ul style="list-style-type: none"> • Starting with an even larger sample to allow more sub-group analyses • Applying the 'early capture plus longitudinal follow-up' approach to more narrowly defined, random or non-random samples • Extending the time horizon of the project to further reduce the risk of confounding process duration with ultimate degree of success |
| <i>Using longitudinal data</i> | <ul style="list-style-type: none"> • Ensuring IV-DV time separation both through data waves and gestation activity time stamp information • Examining effects of the same IVs at different times, and on the same DV at different times • Checking and correcting for non-random attrition • Applying state of the art data imputation techniques | <ul style="list-style-type: none"> • Extending the time horizon • Using new technologies for more frequent data collection, further reducing retrospection bias |

11. Appendix 1: Contents and other basic description of articles in the three research sub-stream

TABLE A1

Summary of findings on the characteristics of nascent entrepreneurs.

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | Comparison | Findings |
|---------------------------|----------------|----------------|----------------|----------------|------------------------------------|----------------|----------------------------------|---|
| Campbell & deNardi (2009) | US | D | 840 | 1 | Atheoretical | I | NEs vs. GP ^g , gender | Little difference between NEs and GP, overall. Female NEs more likely to have worked for parents, and parents had owned multiple businesses. |
| Carter et al. (2003) | US | A | 558 | 1 | Psychological (entrepreneurship) | I | NEs vs. GP | NEs no different than GP in seeking independence, but less motivated by roles and recognition. Male NEs likely cite innovation and financial success as career reasons. |
| Cassar (2006) | US | A | 500 | 1 | Human capital | I | NE subgroups | Individuals with higher levels of financial and human capital harbor greater growth intentions. |
| Cassar (2007) | US | E | 170 | 4 | Psychological (entrepreneurship) | I | NEs vs. GP | Independence and self-realization are important motivations for entry. Financial motivations determine growth preferences, most strongly so for women. |
| Cassar & Craig (2009) | US | A | 198 | 4 | Cognitive biases | I | NE subgroups | NEs exhibit hindsight bias. Unsuccessful NEs correct their previous overestimation of their chances of success. More highly educated exhibit less overconfidence. |
| Cassar et al. (2009) | US | G | 1261 | 4 | Psychological | I | NEs vs. GP | Increased entrepreneurial self-efficacy is associated with entry. |
| Chandler et al. (2005) | SE | E | 408 | 5 | Eclectic | T | Team composition | Large NE teams are more likely than small NE teams to take on additional members, but not more likely to drop members. |
| Davidsson & Honig (2003) | SE | E | 380 | 4 | Social and human capital | I | NEs vs. GP | Bridging and bonding social capital are robust predictors for engagement in NE-ship; as is general human capital and prior start-up experience. |
| Delmar et al. (2000) | SE | A | 1113 | 1 | Eclectic (entrepreneurship) | I | NEs vs. GP | Higher levels of HC are associated with NE status. Males, recent immigrants, those between 25-34 years, and those with role models are more likely to engage. |
| Dimov (2010) | US | E | 206 | 2 | Eclectic (org. emergence) | I | NE subgroups | NEs who possess higher levels of human capital in the form of prior start-up experience exhibit increased confidence in their current opportunity. |
| Diochon et al. (2005a) | CA | E | 119 | 3 | Eclectic (entrepreneurship) | I | Gender | No gender or general human capital differences in likelihood that NEs would abandon their venture. |
| Diochon et al. (2007) | CA | E | 91 | 5 | Psychological (attribution theory) | I | NE subgroups | NEs predominantly offer internal-stable attributions in describing positive situations. |
| Diochon et al. (2008) | CA | E | 91 | 5 | Human capital | I | NE subgroups | Neither NEs with prior start-up experience, nor those with business education had discernibly more financial management capability than novices/no business education. |
| Edelman et al. (2010) | US | A | 401 | 1 | Psychological (expectancy theory) | I | Ethnicity | Black and white NEs have different motivations for entry and growth intentions. Both groups associate growth with innovation, however for whites this is coupled with desires for financial success |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | Comparison | Findings |
|------------------------|-----------------|----------------|----------------|----------------|-------------------------------|----------------|--------------------------------------|--|
| Gartner et al. (2008) | US | A | 438 | | Strategy (attribution theory) | V | Gender | Ability dependent opportunity attributions are the most common. However, female NEs are less likely to attribute opportunities as being effort driven. |
| Johnson et al. (2008) | US | E | 1114 | 2 | Psychological (cognitive) | I | NEs vs. GP | NEs are more likely to have an 'innovator' cognitive style than the GP. This cognitive style is also associated with optimism as regards to sales. |
| Kim et al. (2006) | US | A | 1050 | 1 | Eclectic (sociology) | I | NEs vs. GP | Neither financial nor cultural capital discriminates NEs from the GP on entry. Human capital is a significant advantage, especially education or managerial experience. |
| Kroeck et al. (2010) | US | E | 738 | 4 | Psychological (cognitive) | I | NEs vs. GP, gender, ethnicity | NEs exhibit a stronger internal locus of control compared to GP. Findings for gender and ethnicity were mixed. |
| Liao & Welsch (2003) | US | A | 462 | 1 | Social capital | I | High tech NEs vs. others | Structural, relational and cognitive social capital leads to growth intentions. Structural social capitals' effect on aspiration is less for technology based NEs. |
| Liao & Welsch (2005) | US | A | 544 | 1 | Social capital | I | NEs vs. GP, high tech NEs vs. others | No quantitative differences in various dimensions of SC between NE and the GP. However patterns of association between social, relational and cognitive SC do differentiate NEs. Technology based NEs have higher relational capital. |
| Long et al. (2010) | CN | D | 293 | 1 | Atheoretical | V | NE subgroups | Chinese NEs are most likely to enter out of necessity. Most ventures are not technology based, and more often started by an individual NE. |
| Manolova et al. (2008) | US | A | 441 | 4 | Psychological (expectancy) | I | Gender | Different motivations for entry between men & women. Men are motivated by financial gain; self-realization & autonomy; in addition to these women expect status. |
| Matthews et al. (2009) | US | D | 815 | 1 | Eclectic | I | NE subgroups | NEs with a higher risk tolerance expect higher growth, as do those that engage in formal planning. |
| Menzies et al. (2004) | CA | A | 144 | 1 | Eclectic (capital) | I | Gender | Limited gender differences among NEs regarding human and financial capital. Educational background explains gender difference in type of venture pursued. |
| Menzies et al. (2006) | CA | G | 148 | 5 | Eclectic (entrepreneurship) | I | Gender | Women have different educational background, lower growth expectations to men, and start different businesses targeting distinct markets. |
| Parker (2011) | US [†] | D | 1214 | 1 | Human capital | I | Intrapreneurs vs. NEs | Entry is via self selection. Attribute which predispose individuals to start-up efforts at all, also predispose them to prefer entrepreneurship over intrapreneurship. |
| Petrova (in press) | US | G | 1049 | 3 | Economic (psychology) | I | NEs vs. GP, NE subgroups | The entry decision for part-time NEs is not affected by financial constraints, much like that of full-time NEs. |
| Pistrui et al. (2010) | US | A | 414 | 1 | Sociological | I | NE subgroups | Ventures with family role models and team members have clearer strategic visions and wealth creation motives. |
| Reynolds (1997) | US* | D | 1016 | 1 | Atheoretical | I | NEs vs. GP, ethnicity, gender | NEs have higher levels of prior start-up experience, education, than the GP. Overall financial capital does not distinguish NEs, except in of some ethnic sub-groups |
| Reynolds et al. (2004) | US | A | 1261 | 1 | Atheoretical | N | NEs vs. GP, NE subgroups | Male NE entry rates are twice that of women. Black NE participation is twice that of whites. Human capital is an overall driver of NE entry, and education is particularly so for Blacks and Hispanics. Men are more likely to form teams. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | Comparison | Findings |
|----------------------------|----------------|----------------|----------------|----------------|---|----------------|------------------------------|--|
| Rotefoss et al. (2005) | NO | E | 203 | 3 | Eclectic (human capital) | I | Intending NEs & actual NEs | Education predicts NE status but not intention. Prior experience regardless of success is associated with intention and NE status. Environmental factors have mixed effects. |
| Ruef et al. (2003) | US | A | 816 | 1 | Sociological | T | Team composition | Strong ties drive NE team formation, and are thus characterized by homophily and network constraints. Over half of NE teams are spousal teams. |
| Sardy & Alon (2007) | US | A | 830 | 1 | Eclectic (human capital) | I | Franchisee NEs vs. other NEs | Franchisees have less experience, less confidence in their skills, and less capital than other NEs, however they expect more certain business income. |
| Schenkel et al. (2009) | US | A | 1114 | 1 | Psychological (need for closure) | I | NEs vs. GP | The need for cognitive closure is positively associated with entrepreneurial entry. NEs have a higher need for this stability and order than do the GP. |
| Schjoedt & Shaver (2007) | US | A | 845 | 1 | Psychological (work motivation) | I | NEs vs. GP | Life-satisfaction does not distinguish NEs from the GP, and there is little evidence of push motivation towards entrepreneurial entry as a necessity. |
| Singh & Lucas (2005) | US | D | 882 | 1 | Eclectic (human capital) | I | Homemaker NEs vs. others | Compared to other NEs, homemaker NEs have less education, aim for low potential opportunities requiring less capital, and that which is sought informally. |
| Singh & Crump (2007) | US | A | 2003 | 1 | Atheoretical | I | Ethnicity, NEs vs. GP | Education predicts NE entry for Blacks. Black NEs are more educated than Black GP. |
| Singh et al. (2008) | US | D | 726 | 1 | Eclectic (entrepreneurship) | I | Ethnicity | Black NEs create ventures with lower potential than whites, and expect significantly lower revenue. |
| Tang & Tang (2007) | US | A | 227 | 1 | Eclectic (organizational emergence) | V | Environment | Risk-taking propensity impedes performance in low munificence environments. <i>nAch</i> is associated with NE performance regardless of environmental munificence. |
| Tang et al. (2008) | US | A | 315 | 1 | Psychological (Austrian economics) | I | NE subgroups | NEs with internal attribution style have a higher risk taking propensity, need for achievement, and commitment to their venture. |
| van Gelderen et al. (2006) | NL | A | 167 | 1 | Psychological (motivation) | I | None | NE entry is associated with dual autonomy motivations: (1) task characteristics of self-employment, and (2) instrumental motivations to achieve self actualization. |
| Xu & Ruef (2004) | US | A | 1261 | 1 | Psychological (organizational learning) | I | NEs vs. GP | NEs are more risk averse than GP. Actions are driven by the non-financial motivation of autonomy and identity. |

TABLE A2

Summary of findings on the antecedents and characteristics of the new venture creation process.

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | Process | Findings |
|--------------------------------|----------------|----------------|----------------|----------------|---------------------------------------|----------------|--------------|---|
| Alsos & Kolvereid (1998) | NO | B | 159 | 2 | Eclectic (entrepreneurship) | I | Exploitation | Parallel entrepreneurs are more likely to gain income early & get operational, despite slower process, & starting part-time. Serial entrepreneurs start full time with high activity early on. |
| Alsos & Ljunggren (1998) | NO | B | 149 | 2 | Eclectic (entrepreneurship) | I | Exploitation | Some gender differences in the process, but not in getting operational. Females take more time between activities; more likely to seek government funds; less likely to prepare a business plan. |
| Brush et al. (2008a) | US | F | 280 | 1 | Strategy (resource based view) | V | Exploitation | Different exploitation process for home-based and away-based businesses. Overall higher aspiration leads to greater resource assembly. Away-based assemble more organizational rather than physical or financial resources. |
| Campbell & deNardi (2009) | US | D | 840 | 1 | Atheoretical | I | Exploitation | Ventures are mainly financed by own saving and loans from family or friends. Minority of NEs seeks business loans, and only half are approved. |
| Cassar (2009) | US | B | 200 | 1 | Eclectic | V | Exploitation | Planning is positively associated with gaining external funding. For early stage ventures in competitive environments cash statements are important, while forecasting more so for high-tech ventures. |
| Cassar et al. (2009) | US | G | 1261 | 4 | Psychological | I | Exploitation | Increased investments of work effort and financial capital are linked to higher levels of self-efficacy. |
| Cassar & Ittner (2009) | US† | B | 693 | 1 | Organizational sociology (legitimacy) | V | Exploitation | Intended and actual retention of an accountant is associated with venture scale and the initiation of banking activity, while lawyers are engaged during time of venture uncertainty. |
| Delmar & Shane (2003) | SE | F | 223 | 5 | Eclectic | V | Exploitation | Business planning accelerates product development and venture organizing activity. |
| Eckhardt et al. (2006) | SE | B | 221 | 5 | Eclectic | V | Exploitation | Prior to (stage 2) receiving funding NEs must seek it (stage 1). Seeking finance is based on perceptions of competition and growth. Getting external funding is based on objective indicators of venture development such as marketing and sales. |
| Edelman et al. (2008) | US | F | 715 | 1 | Eclectic | V | Exploitation | Successful exploitation actions differ from those taught in many textbooks. Textbooks emphasize seeking funding and hiring employees more than NEs do. NEs prioritize resource assembly and seeking cash flow but this is not given proper accord in texts. |
| Edelman & Yli-Renko (in press) | US | F | 114 | 4 | Eclectic (entrepreneurship) | V | Discovery | Perceived market opportunity is associated with level of start-up activity. The discovery process mediates between the dynamic characteristics of the environment and the entrepreneurs' efforts to start a new venture. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | Process | Findings |
|-------------------------|-----------------|----------------|----------------|----------------|---|----------------|-------------------------|--|
| Honig (2001) | SE | B | 283 | 3 | Organizational learning | I | Discovery | For most NEs engagement is driven by elaborating a heretofore unconsidered opportunity rather than a systematic search preceded by the decision to start a business. Independent NEs more likely cite fortuitous discovery than do intrapreneurs. |
| Honig & Karlsson (2004) | SE | F | 396 | 5 | Organizational sociology (institutional theory) | V | Exploitation | Those NEs who had sought assistance from external agents and in industries where business planning was normative behavior were more likely to produce a business plan. |
| Liao et al. (2005) | US | F | 668 | 4 | Eclectic (entrepreneurship) | V | Exploitation | Exploitation process is complex. There do not appear to be discrete developmental stages or distinct clusters of activity nor is there support for a simple linear accumulation of actions. |
| Liao & Welsch (2008) | US | B | 206 | 4 | Eclectic (entrepreneurship) | V | Exploitation | Technology based start-ups have a longer gestation period, and engage in a greater number of activities. Planning is more intensive in these cases, as is legitimacy establishment and resource assembly. However, the association patterns in venture creation activities for technology based start-ups are no different from other start-ups. |
| Long et al. (2010) | CN | D | 293 | 1 | Atheoretical | V | Discovery, exploitation | Opportunity driven NEs are more likely to engage in systematic search. A majority of NEs saved money for their venture. Only a small number sought external funding. |
| Matthews et al. (2009) | US | D | 815 | 1 | Eclectic | I | Exploitation | Nascent intrapreneurs engage in more formal business planning. |
| Menzies et al. (2006) | CA | G | 148 | 5 | Eclectic (entrepreneurship) | I | Exploitation | The exploitation process is quite similar across gender. Women create business plans equally, and take just as long to start-up as men. |
| Murphy et al. (2007) | US | F | 711 | 1 | Signaling theory | V | Exploitation | Female NEs signal higher legitimacy through expert social capital. This in turn leads to successful informal funding for their ventures. |
| Parker (2011) | US [†] | D | 1214 | 1 | Human capital | I | Exploitation | NEs leverage their general human capital and social ties to organize ventures selling directly to customers, while intrapreneurs commercialize opportunities to sell to other businesses. |
| Patel & Fiet (2009) | US | F | 492 | 2 | Economics (Austrian) | I | Discovery | Nature of discovery process effects exploitation. Emphasizing premeditated processes, rather than serendipitous discovery facilitates exploitation. |
| Petrova (in press) | US | G | 1049 | 3 | Economic (psychology) | I | Discovery, exploitation | NEs financial constraints and time invested in the start-up attempt are not related, be they part-time or full-time. Part-time NEs that consider start-up as a learning process are more likely to devote more time. |
| Reynolds (1997) | US [*] | D | 1016 | 1 | Atheoretical | I | Exploitation | The exploitation process is a unique combination of events that lead to new businesses start-up. There is no single determinant of NE entry into the process. |
| Reynolds (2011) | US [†] | F | 660 | 3 | Atheoretical | V | Discovery, exploitation | On average start-ups take been 12 and 18 months to transition from being "thought about" into an effort intense enough to be considered serious. A further 12 months later 9% report first profits, and by 23 months 24% report discontinuation. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | Process | Findings |
|-----------------------------|----------------|----------------|----------------|----------------|---------------------------------------|----------------|-------------------------|--|
| Samuelsson et al. (2009) | SE | F | 259 | 4 | Social and human capital | V | Exploitation | Two distinct processes: innovative and imitative, which should be treated differently. Explanatory power better for innovative processes. |
| Singh & Lucas (2005) | US | D | 882 | 1 | Eclectic (human capital) | I | Exploitation | Homemaker NEs approach the exploitation process differently, having lower funding needs, and financial projections. No difference in business plan preparation or start-up location. |
| Singh et al. (2008) | US | D | 726 | 1 | Eclectic (entrepreneurship) | I | Discovery | Black NEs more likely to pursue an externally-stimulated or decision driven process than White NEs. |
| Smith et al. (2009) | US | B | 285 | 1 | Knowledge management | V | Discovery | Different opportunities require different processes. Codified opportunities are best discovered by systematic search, while tacit opportunities require prior knowledge. |
| Tang (2008) | US | B | 526 | 2 | Psychological (Austrian economics) | I | Discovery, exploitation | Positive relationship between environmental munificence and alertness, although moderated by self-efficacy. Alertness is positively related to commitment. |
| Tang (2009) | US | B | 365 | 1 | Psychological (Austrian economics) | I | Discovery | Achievement motivation is positively related to alertness, especially in highly munificent environments. While internal locus of control relates to alertness under low munificence. |
| Tornikoski & Newbert (2007) | US | F | 830 | 3 | Organizational sociology (legitimacy) | V | Exploitation | The duration of the start-up effort is highly important in determining organizational emergence, in particular hiring employees. So too, resource combination activities are influential on emergence. |
| Trevelyan (2009) | US | F | 597 | 4 | Psychological (social cognition) | I | Discovery, exploitation | Positive attitudes (self-efficacy, confidence and commitment) enable both discovery (search strategies) and exploitation (organizing activities). |
| Van Gelderen et al. (2011) | NL | F | 414 | 5 | Eclectic (psychological) | V | Exploitation | Just over half of all start-ups encounter some problem during their efforts. The most common problems were related to regulation, finance, or organizational issues. Very few report time shortage or problems with the product/service they intend to sell. |
| Yusuf (2010) | US | B | 669 | 1 | Atheoretical | V | Exploitation | Approximately one quarter of NEs access assistance programs during start-up. Of those who did three quarters do not find the assistance program met their needs. |

TABLE A3

Summary of findings explaining new venture creation outcomes.

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | IV | DV | Findings |
|--------------------------|----------------|----------------|----------------|----------------|-----------------------------------|----------------|----------------------------|--------------------------------------|---|
| Brush et al. (2008a) | US | F | 280 | 1 | Strategy (resource based view) | V | Capital | First sales | Home based businesses are more likely to achieve first sales; however this is hindered by high growth aspirations. |
| Brush et al. (2008b) | US | C | 646 | 4 | Organizational | V | Capital, process, planning | Persistence | While intentionality is not a prerequisite, increased action leads to persistence. Firms that organize more slowly are more likely to persist. |
| Carter et al. (1996) | US* | C | 71 | 2 | Eclectic (entrepreneurship) | I | Process | Status | Different exploitation sequencing for those who get operational or terminated on the one hand vs. those 'still trying' on the other. Full time involvement, team formation, legal entity creation, intense search for facilities and finance lead to either operational or terminated ventures. Those still trying were occupied by planning and preparation. |
| Cassar (2007) | US | E | 170 | 4 | Psychological (entrepreneurship) | I | Cognition | Get operational, growth | Higher sales are realized by those with high growth preferences. Independence motivated NEs are less willing to take on employees. No difference in career reasons for entering NEs and operational NEs. |
| Cassar & Friedman (2009) | US | G | 1261 | 4 | Psychological | I | Cognition, capital | Get operational, growth intention | Self-efficacy lifts the chances of reaching operational status. |
| Cassar (2010) | US | C | 368 | 4 | Psychological (cognitive) | I | Cognition, planning | Get operational, sales | NEs are too optimistic predicting whether the venture will get operational. Those who do overestimate the expected level of sales, particularly if financial projections had been prepared. |
| Chandler et al. (2005) | SE | E | 408 | 5 | Eclectic | T | Capital | Reaching milestones | Initial team size is positively associated with reaching profitability, however new additions to the team may be detrimental in this regard. |
| Davidsson & Honig (2003) | SE | E | 380 | 4 | Social and human capital | I | Capital | Making progress, first sales, profit | Prior start-up experience and social capital are determinants for advancement through the start-up process. Joining a business network has a positive effect on making progress, first sales, and profitability. |
| De Clercq et al. (2009) | CA | C | 81 | 2 | Psychological (expectancy theory) | I | Cognition | Persistence | Self-efficacy and perceptions of normative support strengthens NEs goal commitment. While perceptions of external funding have differential effects depending on whether public or private. |
| Delmar & Shane (2003) | SE | F | 223 | 5 | Eclectic | V | Process, planning | Persistence, making progress | Business planning facilitates product development, and other organizing activates. NEs who have prepared a business plan are more likely to persist. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | IV | DV | Findings |
|--------------------------------|----------------|----------------|----------------|----------------|---|----------------|------------------------------|---------------------------------------|---|
| Delmar & Shane (2004) | SE | C | 223 | 5 | Organizational sociology | V | Capital, process, planning | Reaching milestones | Legitimizing activities (establishing a legal entity, business planning) facilitate further organization and increase the likelihood of persistence. |
| Delmar & Shane (2006) | SE | C | 223 | 5 | Eclectic | V | Capital | Persistence, sales | Having started a business previously is salient; however there is a diminishing effect. New ventures whose founding teams have greater start-up experience are more likely to survive. |
| Dimov (2010) | US | E | 206 | 2 | Eclectic (organizational emergence) | I | Cognition, capital, planning | Terminated, still trying, operational | Increased confidence in opportunity and industry experience are directly related to venture emergence. While early planning and prior entrepreneurial experience are indirectly related though opportunity confidence. |
| Diochon et al. (2005a) | CA | E | 119 | 3 | Eclectic (entrepreneurship) | I | Cognition | Persistence | Terminated NEs are more likely to have been encouraged to enter business by others, focused on growing, and exhibit a mismatch between their cognitive style and what was required by the business. |
| Diochon et al. (2005b) | CA | C | 104 | 4 | Eclectic | V | Capital | Persistence | There is considerable volatility in the outcomes reported from year to year and indicate that sustainable operating ventures can be distinguished from others according to the activities undertaken during start-up. |
| Diochon et al. (2007) | CA | E | 91 | 5 | Psychological (attribution theory) | I | Cognition | Persistence | NEs who terminate their start-up attempts do not entirely discount their role in this outcome. Despite this they are no less likely to consider trying again. |
| Diochon et al. (2008) | CA | E | 91 | 5 | Human capital | I | Capital | Persistence | Domain-specific HC not associated with persistence; however financial management capability was show to be positively associated with success. |
| Edelman et al. (2008) | US | F | 715 | 1 | Eclectic | V | Process, planning | Get operational | Despite correlations between textbooks and successful NE actions, such as financial statement preparation, marketing effort, and investing one's own finances, there are some disconnects. Legitimizing activities are associated with success but neither taught nor oft performed by NEs. |
| Edelman & Yli-Renko (in press) | US | F | 114 | 4 | Eclectic (entrepreneurship) | V | Cognition | Persistence | Commitment facilitates success: Increased venture creation activity by NEs leads to increased likelihood that they will get operational. |
| Honig & Karlsson (2004) | SE | F | 396 | 5 | Organizational sociology (institutional theory) | V | Process, planning | Persistence, profitability | While there is marginal support for the notion for business planning increasing persistence, business planning had no effect on venture profitability. |
| Johnson et al. (2008) | US | E | 1114 | 2 | Psychological (cognitive) | I | Cognition | Persistence, operational, sales | NEs with innovative rather than adaptive cognitive style are likely to disengage from the process. Cognitive style does not influence sales outcomes. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | IV | DV | Findings |
|---------------------------------|----------------|----------------|----------------|----------------|---------------------------------|----------------|----------------------------|---------------------------------------|---|
| Kroeck et al. (2010) | US | E | 738 | 4 | Psychological (cognitive) | I | Cognition | Persistence | NEs who exited their venture after one year had lower internal locus of control than those who persisted. However in subsequent annual follow-ups this difference was not found. |
| Liao et al. (2005) | US | F | 668 | 4 | Eclectic (entrepreneurship) | V | Process | First sales | A number of activities are associated with reaching first sales: investing NEs own money, defining market opportunities, assembling raw materials and inventory, sourcing suppliers, initiating marketing, spending time developing business ideas, and making explicit procedures. |
| Liao & Gartner (2006) | US | C | 276 | 4 | Eclectic | V | Capital, process, planning | Persistence | Strong main effect for business planning on persistence. Venture persistence increases with early planning in uncertain environments, but increases when NEs plan later in more certain environments. |
| Liao & Gartner (2007) | US | C | 312 | 4 | Eclectic | V | Process, planning | Terminated, still trying, operational | NEs who wrote a business plan were more likely to create an operational business, as were those who accessed government assistance. |
| Liao et al. (2008) | US | C | 830 | 2 | Eclectic (capital) | V | Capital | Persistence | Resource based advantages are more salient for technology based ventures, than non-technological. Those ventures that access a larger resource pool are less likely to abandon their attempt. |
| Lichtenstein et al. (2007) | US | C | 109 | 2 | Complexity theory | V | Process | Get operational | Process dynamics successfully predict firm emergence. Firms that get operational are more likely to have had been in the process longer, with a higher rate of action, which increases in concentration later on. |
| Menzies et al. (2006) | CA | G | 148 | 5 | Eclectic (entrepreneurship) | I | Capital | Get operational | Start-up teams are much more likely to achieve an operating business, than those who attempt this alone. Women as successful as men. |
| Murphy et al. (2007) | US | F | 711 | 1 | Signaling theory | V | Cognition, capital | Persistence, net worth | Greater venture longevity is achieved by those ventures possessing higher levels of perceived legitimacy. |
| Newbert (2005) | US | C | 817 | 1 | Strategy (dynamic capabilities) | V | Capital, process, planning | Making progress, first sales | Although a range of gestation activities predict reaching first sales. As market dynamism increases, so too does process complexity and consequently a lesser number of gestation actives successfully predict firm foundation. |
| Newbert & Tornikoski (in press) | US | C | 402 | 5 | Social capital | V | Capital | Reaching milestones, get operational | Network growth, content and relationship mutiplexity are positively associated with venture emergence. The effect of network growth on emergence is moderated by network structure. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | IV | DV | Findings |
|-------------------------------|----------------|----------------|----------------|----------------|---------------------------------------|----------------|---------------------------------------|---------------------------------------|---|
| Parker & Belghitar (2006) | US* | C | 873 | 2 | Eclectic | I | Capital, process, planning | Terminated, still trying, operational | Delaying NE entry may be valuable in achieving positive outcomes, and those with access to more financial resources are more likely to do so. Gender does not affect outcomes. Those who establish credit, receive income from sales and invest their own money are more likely to be successful. |
| Patel & Fiet (2009) | US | F | 492 | 2 | Economics (Austrian) | I | Cognition | Making progress | NEs using deliberate systematic search reduce the hazard of environmental uncertainty make better progress than those who rely on alertness alone. |
| Petrova (in press) | US | G | 1049 | 5 | Economic (psychology) | I | Capital | Sales | The income and asset position of part-time entrepreneurs affects revenue expectations but has little effect on actual venture revenue. |
| Reynolds (2011) | US† | F | 660 | 3 | Atheoretical | V | Process, capital | Terminated, still trying, operational | Informal financial support is not strongly related to outcomes. Discontinued ventures are unlikely to have attracted formal financial support. |
| Rotefoss & Kolvereid (2005) | NO | E | 203 | 3 | Eclectic (human capital) | I | Capital | Reaching milestones | Although environmental factors have some effect, successful prior experience is the single most important factor for predicting the outcome of the business start-up process. |
| Samuelsson & Davidsson (2009) | SE | F | 259 | 4 | Social and human capital | V | Capital | Making progress | Human capital has differential effect, increasing progress in innovative ventures, while having a negligible influence in imitative ventures. Social capital becomes increasingly important over time. |
| Shane & Delmar (2004) | SE | C | 223 | 5 | Psychological (goal setting theory) | V | Capital, process, planning | Making progress, persistence | NEs that planned before talking to customers and beginning marketing are more likely to persist. Making progress decreases the likelihood of termination. |
| Tornikoski & Newbert (2007) | US | F | 830 | 3 | Organizational sociology (legitimacy) | V | Capital, process, planning | Reaching milestones | Strategic actions taken are more important to reaching emergence milestones than conforming characteristics such as human capital. |
| Townsend et al. (2010) | US | C | 316 | 4 | Psychological (cognitive) | I | Cognition, capital, process | Get operational | Ability expectancy is a stronger predictor of outcomes than outcome expectancy. Resource combination and improvisation lead to emergence. |
| Trevelyan (2009) | US | F | 597 | 4 | Psychological (social cognition) | I | Cognition | Get operational, sales | While self-efficacy, confidence and commitment are positively related to getting operational, they do not have an effect upon sale performance. |
| van Gelderen et al. (2005) | NL | C | 517 | 5 | Eclectic (organizational emergence) | I | Cognition, capital, process, planning | Get operational | Market risk perception is an important driver of getting started. Initial as well as evolving perceptions of risk increase abandonment. |

| Article | S ^a | G ^b | N ^c | W ^d | Theory ^e | L ^f | IV | DV | Findings |
|----------------------------|----------------|----------------|----------------|----------------|--------------------------|----------------|---------|-----------------|--|
| van Gelderen et al. (2011) | NL | F | 414 | 5 | Eclectic (psychological) | V | Process | Get operational | The number and type of problems encountered during start-up are similar for both successful and unsuccessful attempts. Different reasons are attributed to problems during start-up compared to venture abandonment. |

TABLE NOTES: Tables A1-A3

Note: a) S denotes origin of study by two letter country code: CA = Canada; CN = China; NL = Netherlands; NO = Norway; SE = Sweden; US = United States of America (PSED) † = data from PSED II study, * = data from a PSED precursor study or pooled data: Carter et al. (1996) uses two samples, Wisconsin and US wide; Reynolds (1997) used a single sample from Wisconsin; Parker and Belghitar (2006) uses cases from PSED and three other PSED-like studies: pre-PSED (Carter et al., 1996), Netherlands, and Canada; b) G denotes broad topic area of article (person, process, outcome, or intersection of these) according to Figure 1; c) N denotes the number of NEs (or NEs plus comparison group) analyzed for this article d) W denotes the number of waves of data collection used in analysis for this article; e) Theory refers to the main theory, perspective or framework employed, with brackets denoting specific foci or literatures; f) L denotes principle level of analysis: I = Individual; T = Team; V = Venture; N = National; g) GP denotes General Population.

[AUTHOR SUGGESTION: Put this note under the first or the smallest table. Under the others put a note referring to this table's note]

12. Appendix 2: Publication performance and theory-drivenness of the three sub-streams

TABLE A4

Publications by topical focus and journal tier

| <i>Journal Tier</i> | Tier 1 | Tier 2 | Tier 3 |
|-------------------------|--------|--------|--------|
| <i>Article category</i> | | | |
| Person only (22 art.) | 18% | 36% | 46% |
| Process only (11) | 36% | 9% | 55% |
| Outcomes only (17) | 59% | 24% | 18% |
| All Person (42) | 21% | 29% | 50% |
| All Process (34) | 26% | 29% | 44% |
| All Outcomes (43) | 42% | 26% | 30% |
| All articles (83 art.) | 33% | 30% | 37% |

Note: Tiers based on the comprehensive (20,000+ journals) Australian national 'ERA-list' (http://www.arc.gov.au/era/era_journal_list.htm). Tier 1 = ERA 'A*' (5% of all journals); Tier 2 = ERA 'A' (15%); Tier 3 = ERA 'B' or 'C' (80%) or unlisted. Tiers 1 and 2 but not Tier 3 generally comprise of journals with an SSCI impact factor.

The compilation in Table 4 suggests that overall the research stream has fared well with one third of all articles published in the top tier, which comprises only 5 percent of all journals. Table A4 also shows that the Outcomes sub-stream has the highest prevalence in higher tiers. The relative publishing success of Person and Process articles, respectively, comes out differently depending on whether we focus on the top or the bottom end of the journal tier distribution. Apart from more technical methods issues highlighted in the main text the differences in publishing success may in part be related to differences in the respective degrees of theory-drivenness. We coded for this in two ways: a) whether hypotheses were stated, and b) whether the entire set of hypotheses was derived from one or two well articulated theories (rather than, e.g., drawing on an eclectic mix of various theoretical inputs, logical reasoning, and results from past research). With 86 and 33 percent of the articles clearing the respective criteria, the Outcomes sub-stream appears to be the most theory-driven of the three (the corresponding figures for Person being 79 and 28, and for Process 68 and 24). Not being coded as 'theory-driven' does not imply a completely theory-less approach; only eight percent of the articles were coded as 'atheoretical'.

13. Appendix 3: Examples of good handling of methods challenges in PSED-type research

Our highlighting of the below studies does not mean they are the only examples of effective handling of methods issues pertaining to nascent entrepreneurship research. However, they are good ‘case studies’ that can serve as inspiration for others to follow.

In their series of papers, Frederic Delmar and Scott Shane examine effects of human capital and business planning on outcomes (Delmar & Shane, 2003, 2004; 2006; Shane & Delmar, 2004). They consistently apply the venture level of analysis. To reduce the associated sampling biases they restrict the sample to start-up processes initiated within the first 9 months of the year of the first interview. They use multiple waves of data and thus have time separation of IV and DV, and they control for sample attrition. In response to heterogeneity they control for human capital, venture type, and development stage. In some analyses they do the latter by reorganizing the data set in terms of monthly spells corresponding to each venture’s own time line rather than interview waves, which occur at varying points of the ventures’ development. They also consider causal heterogeneity by modeling moderation (Delmar & Shane, 2006) and mediation (Eckhardt, Shane and Delmar, 2006). Attempting to explain which ventures receive outside funding, the latter apply a particularly interesting combination of levels awareness and mediation in a multistage selection approach using individual-level variables to explain who seeks external funding, and then applying venture level variables to predict who receives it, given that it is sought. This approach responds to the notion that *entrepreneurship requires human agency* (Shane, 2003). It may therefore deserve broader application. Further, while interpreting DVs reflecting persistence as success indicators is a relative weakness of this series of papers, these authors can be lauded for consistently using multiple DVs; perhaps most fruitfully so in Delmar and Shane (2006). This manuscript also includes non-linear hypotheses.

Dimov (2010) examines effects of human capital and business planning on venture outcomes. Due to limitations of available operationalizations he restricts his sample to only include solo founders, noting that this also reduces heterogeneity problems. These are further handled through controlling for a number of individual level variables in addition to human capital, which is a main theorized explanatory variable. While neglecting founder wealth and venture type effects, he controls for stage of development both in terms of time in the process and as number of already completed gestation activities. Theoretically his main approach to heterogeneity lies in modeling effects of human capital as mediated rather than assuming direct (deterministic) effects. Further, he uses multiple waves of data collection not only to achieve IV-DV time separation but also to perform analyses of effects on the same DV after different periods of elapsed time. By hypothesizing and testing positive effects of *early* business planning (which can also be seen as a form of nonlinear or moderator hypothesis) he makes good use of gestation activity time stamp information. In order to secure robustness of the results and the accuracy of their interpretation he tests his model on alternative formulations of the DV, and with two different analysis techniques.

Lichtenstein et al. (2007) apply a clear venture level focus in their analysis of effects of temporal process patterns on outcomes. They therefore restrict their sample to ventures initiated within 24 months of the first interview in order to reduce sampling biases. They also restrict their analysis to terminated vs. operational cases, eliminating the ambiguous ‘still trying’ category (one could argue that more ideally, analyses both with and without the ‘still trying’ group should have been provided). The authors also see this as a safeguard against confounding process duration with outcome quality: “We do not wish to make assumptions a priori that a firm that emerges (or is abandoned) in (e.g.) 6 months is somehow ‘better’ than a firm that emerges (or is abandoned) in 12 months” (p. 250). Further, while only using two waves of data (enough to secure IV-DV separation) these authors study the process and its influence on outcomes by concentrating not on the sequence or timing of *particular* activities, but in terms of the *timing, rate* and *concentration* of *any* activity. This choice of focus also means that they make creative use of the gestation activity time-stamp information. To reduce confounding influence of unmeasured heterogeneity they include well considered control variables, including indicators of venture type and stage of development (but not wealth or human capital). They also use two different operationalizations of ‘getting operational’ (i.e., employ multiple DVs) carefully discussing pros and cons of each; correctly labeling the subjective alternative ‘*perception* of emergence’, and showing explicit awareness that their DVs do not necessarily equal ‘success’ as not getting operational “may indicate a positive, evidence-

based decision to stop efforts on a venture that has little likelihood of successfully emerging” (p. 250). Overall, this article provides what is possibly the best example of explicit discussion of well considered choices in relation to several of the intricate methods issues we have discussed above.

Finally, in terms of use of longitudinal data and dealing with heterogeneity issues the study by Samuelsson and Davidsson (2009) also deserves mention, although this article has weaknesses in terms of lacking sample restriction and relying on a single outcome variable, which reflects ‘making progress’ rather than ‘success’. In their examination of process differences between innovative and imitative start-ups their application of Longitudinal Growth Modeling (LGM) is particularly interesting. This technique allows making full use of the longitudinal nature of the data, e.g., in terms of use of both IVs and DVs being assessed at several different points in time. The method is designed to analyze growth, here represented by accumulation of completed gestation activities as DV. It models variance in initial status as well as in development over time, which effectively takes care of temporal heterogeneity. Considering heterogeneity also by including controls for human capital, venture type and stage of development these authors analyze the outcome drivers for innovative and imitative ventures separately. These sub-sample analyses show that the explanatory models are very different for the two categories – much more so than what could be represented by a few moderator effects in a full sample analysis. Ironically, the explanatory power is considerably lower for the imitative group, suggesting researchers have not been very successful in theorizing and operationalizing the outcome drivers for the ‘modest majority’.