



Replication in entrepreneurship research: a further response to Delmar



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ABSTRACT

This paper continues our debate examining pertinent issues related to scholarship, in particular, whether matters related to technical rigor eclipse the importance of causality, replicability, or that of underlying statistical and methodological assumptions. We report on specific data findings to further stimulate discussion of these important matters.

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1. Introduction

Both authors are elated that vigorous discussion and debate has now entered the discourse around entrepreneurship scholarship. This by itself stands as a highly significant outcome indicative of a maturing scholarly field, as indeed entrepreneurship is becoming. We should all congratulate the editors of this journal and associated scholars regarding this important milestone. Before rushing off to celebrate at the bar, however, we wish to engage the debate generously initiated by Professor Delmar in his most recent response to our article. In doing so, our intention is both to clear the air, so to speak, regarding our own scholarly objectives, and to address some of the weaknesses we encountered in previously published material. Our goal continues to be to examine issues pertinent to our scholarship, for example, questions regarding whether issues related to technical rigor trump or eclipse the importance of causality or replicability, or of underlying statistical and methodological assumptions. In doing so, our intentions are not to spotlight any particular piece of research, but rather to stimulate discussion on these important matters.

We were surprised that Professor Delmar responded to our article with a focus on the technical aspects of what he refers to as 'misunderstandings', but failed to discuss the core issues underlying our assertions. As a reminder, our paper endeavored to do the following:

1. Examine if it was possible to replicate two papers regarding the merits of business planning based on information provided in the original articles, and
2. extend the time frame and add performance data in terms of sales, etc., to the original work.

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Professor Delmar (PD) has given us his thoughtful response, providing technical comments regarding (1) left censoring, (2) left truncation, (3) right censoring and time-varying covariates, (4) fixed-effect regressions to deal with unobserved heterogeneity, and (5) proximal and distal outcome variables.

PD seems to misunderstand or neglect to address our main point in the original paper: the issue of replication. One unfortunate result of our research endeavor was that we were unable to recreate the sample used by D&S and thus found it impossible to replicate the D&S study based on the published information, despite having access to the original data on which that study was based. We were, however, able to recreate and replicate the H&K study. In a footnote to his response, PD indicates that the data and codebook are now publically available on ResearchGate. We applaud this initiative and have, in the same spirit, published the raw data from the Swedish PSED on Dr. Samuelsson's ResearchGate page. We enthusiastically invited other scholars to investigate these issues and report on their findings. A special note of appreciation is therefore due to PD for an excellent idea. We encourage other scholars to follow suit; indeed, top-tier journals should require some sort of data banking explicitly for this very purpose.

Unfortunately, despite having access to PD's data, the main problem remains. That is, even with the codebook, we are unable to replicate or deduce how D&S reached their final sample. From a theory development perspective, we are uncomfortable with this finding, as replication is an integral part of the process we were examining.

It is entirely possible that we misunderstand some of the technical aspects of D&S 2003, as well as PD's response to our paper, but insofar as we understand it, points 1–5 in his response are all related to *time*. This was also our second concern in our replication attempt. Let us go back to D&S's original hypotheses (2003:1169):

Hypothesis 1. : Business planning reduces the hazard of new venture disbanding.

Hypothesis 2. : Business planning facilitates product development in new ventures.

Hypothesis 3. : Business planning facilitates venture-organizing activity in new ventures.

In all of these hypotheses, a causal order of events is implied. The hypotheses state that business planning reduces or facilitates some future event. In other words, business planning should occur before disbanding, product development, and venture-organizing activity. PD also reaffirms this in his response, where he states: "business planning increases organizing activity". He also explains in his response how potential data issues such as left truncation, left censoring, right censoring, etc., may or may not influence the results of different types of statistical analyses. For example, event history modeling can handle time-varying constructs, is sensitive to left censoring and corrects for right censoring. Fixed-effect regression addresses everything from left to right censoring and time-varying constructs.

While we appreciate PD's reminders on these important issues, our point was that the underlying assumption of theory testing is that there exists a relationship between two concepts, A and B, where A is related to B. D&S further state the condition that A (business planning) relates to a subsequent event B (disbanding, product development and organizing activity). PD seems to misapprehend the discussion of causality in our paper. To reiterate, in our attempt to replicate D&S, we discovered that the data regarding both independent and dependent variables were found to be simultaneous rather than ordered.

PD continues to claim that the D&S sample of 223 is inefficient but "better than not dealing with left censoring at all" (Delmar 2014:5). We fully agree with this and commend D&S for trying to extend and improve the technical aspects of entrepreneurship research. PD, however, appears to have missed the key point that we were trying to make. We will now address this important concern. We regret that the discussion which follows is somewhat technical, but we believe that the points we will be touching on are important for general scholarship and methodological reporting.

The major advantage of D&S's event history model is that their sample consisted of ventures started during the first 9 months of 1998 – "(2) the first activity that they took to start the new venture occurred during the first 9 months of 1998,4" (2003:1169). Their dependent variable is that the company is abandoned by all (item 4 in sg14in06-sg14in24²) with month and year attached to it. "*We identify disbanding by asking respondents at each wave of the survey whether all parties pursuing the venture have ceased their effort to pursue it and, if so, in what month that effort ended. By identifying the specific month of cessation*" (D&S 2003:1172). Our second claim in our paper was that in order for event history to be efficient, two main assumptions need to be fulfilled. These are (1) **a common starting point** and (2) **time to an event**. Table 1 is an attempt to recreate the data used by D&S. The first four items are their business planning variable. We can see that 110 cases reported a completed business plan. We only know the year and month from our 12-month and 24-month follow-ups. This means that we only have a reported date for a maximum of 36 cases. In actually, this number is lower – only 27 cases reported a year when they completed their business plan (23.28% reported completing a business plan before 1998), and only 15 cases reported the actual date/month when they completed their business plan. Equally problematic is that the activities measured by the other items in the D&S business-planning variable have dates as early as 1990 – 19.13% reported a projected financial statement before 1998 and 39.00% reported gathering information about competitors and market opportunities before 1998. Overall, between 19% and 39% reported starting venture activities before 1998. Left censoring could potentially be corrected through left truncation, but that would violate the underlying assumption of event history analysis. This requires the researcher to control for time. D&S divide the data into monthly spells. The problem is that only 13 cases

² This is the variable code in the Swedish PSED data.

Table 1
Variable descriptions and data across time Swe PSED.

	Years								#Activity before 98					Total	%activity before 1998	Right censored in%	
	90	91	92	93	94	95	96	97	9806	9812	9906	9912	2006				
Business planning variables first recoded activity																	
Completed business plan (gb02in00-gb02in24)									39	35	19	12	5	110	0.00	0.49	
Work with business plan started year (gb01yn12-gb01yn24)	2		1			1	3	20	27	90		14	12	116	0.23	0.52	
Projected financial statement (gf11yn00-gf11yn24)		1				2	1	18	22	106		7		115	0.19	0.52	
Information about competitors (gg01yn00-gg01yn24)	6	4	3	1	3	9	9	28	63	98		2		100	0.63	0.45	
Dependent variable disbanded																	
Abandoned by all (item 4 in sg14in06-sg14in24)											58	12	13	10	93		
Left what year (sr01yn06-sr01yn24)										5	1	8	6	5	25		
What month (sr01mn06-sr01mn24)										6	8	6	4		24		
Completed business plan and reported month											5	6	4		15		
Completed business plan and abandoned											10	1	1	1	13		
Number of ventures that where disbanded after 1998															16		
Dependent variable product development																	
Product development (gd01yn00-gd01yn24)	10	1	1	1	5	8	11	22	59	69	2		6	2	138	0.43	0.62
Dependent variable organizing activity																	
Filed forms with tax authorities (gq21yn00-gq21yn24)	2	1	1			1	1	3	9	33	4	13	9	2	70	0.13	0.31
Registered with authorities (gq01in00-gq01in24)	1		1			1	1	3	7	59	25	4	8	1	104	0.07	0.47
Discussed company's products/service (gg21yn12-gg21yn24)								1	1	1		4	6	2	14	0.07	0.06
Purchased materials etc. (gr01yn00-gr01yn24)	4	1				4	5	12	26	57	20	4	1	2	110	0.24	0.49
Applied for patent etc. (gp01yn00-gp01yn24)	1				1	1	3	6	12	12		1		1	26	0.46	0.12
Permits and licenses (go01yn00-go01yn24)						1	2	2	5	25			4	3	37	0.14	0.17
Funding (ga01yn00-ga01yn24)							1	2	3	39	1	1	7	7	58	0.05	0.26
Marketing and promotion effort (gm01yn00-gm01yn24)							2	9	11	48	9	7	3	4	82	0.13	0.37

out of 223 report a year and a month for both the completion of a business plan and the juncture at which they abandoned their venture. Further, more than half of the 223 cases actually reported abandoning their venture before or at the same time they completed their business plan. We are familiar with both left censoring and left truncation; rather, our concern here is that PD and D&S both employ a method that clearly violates the time-to-event logic. Moreover, the sample contains no more than 13 cases with reported time data.

Our second concern has to do with the causal order of A leading to B in a fixed-effect regression and the choice of dependent variables. We have already shown that D&S's major variable, business planning, is to some extent spread between 1990 and 2000, with an aggregation of values at the end point of that period. For the sake of discussion, we can posit that the business planning occurs in 1998. As such, D&S's dependent variables should preferably, and certainly in theory, come after 1998, regardless of the merits of hierarchical fixed-effect regressions. A business plan facilitates product development. The problem, once again, is that 46% – almost half of the D&S sample – report product development activity before 1998. We can also see in [Table 1](#) that there is an overlap between business planning activity and product development. The problem here is that D&S seem to be unaware of this in their paper, and further, that PD's response seems to focus on a technical issue rather than the underlying conceptual issue regarding statistical assumptions of theory development and the order of empirical observations.

The final model in the D&S paper includes a dependent variable that called “organizing activity”. Again, the conceptual idea is that business planning predicts organizing activity; A comes before B. As we pointed out in Honig and Samuelsson 2014, D&S use eight items to capture organizing activity. “Every 6 months, beginning with the initial survey, we asked respondents the following questions, coded as ‘1’ if the respondent answered ‘yes’ and ‘0’ if the respondent answered ‘no’: (1) ‘Has the venture filed the necessary forms with the tax authorities?’ (2) ‘Has the venture registered with government authorities?’ (3) ‘Has discussion about the product or service the start-up will sell been initiated with potential customers?’ (4) ‘Have any raw materials, inventory, supplies, or components for the start-up been purchased?’ and ‘Have any major items like equipment, facilities, or property been purchased, leased, or rented for the new start-up (major was defined as an item with a retail value of greater than U.S. \$1000)?’ (5) ‘Has the venture sought to obtain a patent, copyright or trademark?’ (6) ‘Has the venture sought to obtain necessary permits or licenses to operate?’ (7) ‘Has the venture sought to obtain financing?’ (8) ‘Has the venture initiated marketing or promotion efforts?’” (2003:1173). [Table 1](#) reports the distribution of these responses across time. To focus on one example, Item 3 reports only years from the 12-month follow-up. [Table 1](#) also shows that 43% of respondents report product development before 1998. Organizing activity has the same pattern, ranging from 7% to 46%. The business plan items are all concentrated around 1998 and beyond. In other words, B comes before A in up to 46% of the cases. [Table 1](#) also shows that business planning occurs simultaneously with the dependent variables of product development and organizing activity. PD claims that fixed-effect regression examines change over time, “therefore it can incorporate changes in business planning and other organizing activities at whatever time they occur”. The problem, however, is that according to PD, “D&S also claim that business planning **increased** the number of organizing activities initiated”. [Table 1](#) shows that it is more likely that business planning and organizing activity were happening simultaneously across time and that there is a large amount of right censoring in the proximal outcome. D&S's results could actually be construed as suggesting that organizing activity increases business planning, and similarly, that product development actually increases business planning. The key issue is that we don't know which came first, business planning or organizing activity, unless we assume that business planning is a type of organizing activity, which would be a clear violation of D&S's theory and model. In addition, there remain a number of questions regarding how D&S's fixed-effect regression handled left censoring that need to be specified in the model. [Table 1](#) shows that as many as 12%–62% of respondents still have yet to perform any of the items that D&S used in their paper as proxies for organizing activity and product development. Further, given that there is no correlation matrix, we have no idea what variables are missing, nor what their means are for the equations. We found surprisingly high indications of missing variables when we closely examined the data, and without a report on the ‘n’ in any of the three papers, it is very difficult to understand how this was dealt with.

Lastly, although our intention is not to examine the epistemological nature of the work we are attempting to replicate, we are flummoxed by PD's comment that “[o]nce the venture is organized a theory about how business planning facilitates the venture organizing process is not relevant to the performance of the venture”. Weick defines “organization” as follows: “to organize is to assemble ongoing interdependent actions into sensible sequences that generate sensible outcomes” (Weick, 1979:3). This describes a process whose outcomes are numerous, not a state that is achieved as a transitional or final outcome. It seems inappropriate for scholars to treat “being organized” as a discrete dependent variable, as opposed to an ongoing dynamic process (Teece, Pisano and Shuen, 1997) that can be approached very differently according to the heterogeneous nature of the firm (Alvarez and Barney, 2005). Most theorists argue that organizational activity, and the degree and effectiveness of organizational processes, are a constant and crucial aspect of all group performance (Rindova and Kotha, 2001; Nickerson and Silverman, 2003). Further, if some organizations “organize faster” or more efficiently than others, should not there be some kind of relationship between that degree of organization and their eventual performance? Otherwise, what is the point of conducting research? If in fact there is no relationship, perhaps organizing more slowly is preferable, as it was in the fable of the tortoise and the hare.

We hope this discussion fosters additional debate, and helps clear up what may be ‘muddy waters’ regarding the importance of replication, the design of research, and the reporting, access, and verification of previous research.

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