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Are firm growth paths random? A further response regarding Gambler's Ruin Theory

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1. Introduction

Our response to the stimulating paper by [Coad et al. \(2013\)](#) setting out Gambler's Ruin Theory (GRT) has in turn now received its own response from [Coad et al. \(2015\)](#). This discussion is welcome because there is a tendency in the field of entrepreneurship for research to be conducted with little prospect for subsequent testing, attempts at replication and open discussion of implications for theory. Such testing, and verification, using datasets other than that on which the original theory was constructed, is fundamental to advances in understanding and theory building.

There are many issues which we could take up in [Coad et al.'s \(2015\)](#) clarifications. We highlight one central issue overlooked by [Coad et al. \(2015\)](#) in their response to [Derbyshire and Garnsey \(2014\)](#). However, we first note areas of agreement between our point of view and that of [Coad et al. \(2015\)](#). In particular, we commend their adoption of analysis methods that examine firms' growth trajectories rather than the usual reliance in firm growth studies on measures of growth such as mean growth rates that lose information on growth paths and processes, as shown in [Garnsey and Heffernan \(2005\)](#).

The new analysis by [Coad et al. \(2015\)](#) now includes the analysis of stable periods and finds these to be the most frequent episodes in firms' trajectories. The dataset used by Coad et al. and the measurement technique which they used to set out GRT in the first place provide useful corroboration of our position on the extent to which stability or stasis dominates firms' trajectories ([Derbyshire and Garnsey, 2014](#)).

We made a more complete response to GRT published elsewhere ([Derbyshire et al., 2013](#)). There we drew attention to the argument put forward by [Sutton \(1995\)](#) who suggested that a useful theory of firm growth would incorporate strategic and resource factors while attempting to take into account what would happen were growth entirely random. By including random and resource-based factors in their analysis, Coad et al. are moving research in this direction. However, in contrast to Coad et al., we see the concept of complex adaptive systems subject to unpredictable dynamic processes as providing the

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means by which such a theory can be constructed and we do not see gambling analogies as a useful angle of approach. While [Coad et al. \(2013\)](#) concluded that growth paths occur in an 'approximately random fashion', rather than in an entirely random fashion, we do not feel that this detracts from our argument that gambling analogies are not likely to provide a useful lens through which to consider entrepreneurship.

2. Firm growth as indeterminate versus subject to unpredictable processes

In our earlier paper ([Derbyshire et al., 2013](#)), we made the distinction between phenomena to which randomness is attributed because of the difficulty of ascertaining causes as opposed to phenomena that are inherently random. We showed that in order to be truly random a sequence must not exhibit any 'special attribute' or 'typicality' ([Dasgupta, 2011](#), p. 6). We also noted that, related to this, randomness does not imply an equally-distributed outcome, such as an equally-distributed occurrence of heads and tails from a sequence of coin flips. Moreover, random outcomes, we noted, only apply at the collective level of a population, not at an individual level such as the level of an individual new firm or entrepreneur. This is discussed in the literature on randomness cited in our original paper, available online ([Derbyshire et al., 2013](#)).

The distinction between phenomena that are inherently indeterminate and complex adaptive systems in which causal processes are too complex to unravel with precision is highly relevant to the argument put forward by [Coad et al. \(2013\)](#). One of the explicit motivations behind the use of GRT is the view that many decades of research attempting to uncover the resource factors associated with firm performance have borne little fruit. However, the concept of complex adaptive systems can provide an explanation for this perceived failure ([Garnsey and Heffernan, 2005](#)). In our view, new enterprises operate as complex adaptive systems: '[a complex system]...is any system that has within itself a capacity to respond to its environment in more than one way. This essentially means that it is not a mechanical system with a single trajectory, but has some internal possibilities of choice or response that it can bring into play' ([Allen, 2001](#), p. 150). In other words, there is scope for agency and human decision in complex adaptive systems despite the difficulties of ascertaining the precise impact of agents' behaviour ([Garnsey and McGlade, 2006](#)). [Coad et al. \(2015\)](#) cite [Garnsey and Heffernan \(2005\)](#) as inspiring their empirical approach. However, [Garnsey and Heffernan \(2005\)](#) put forward a theoretical perspective on new firms as subject to unpredictable complex dynamic processes, to which [Coad et al.](#) have not responded.

In all complex adaptive systems, the unravelling of feedback effects (which operate in such a way that effects become causes in their turn) and precise measurement of initial conditions is not possible. Differential resources are not the only factor that impinges on firm performance; the local and macroenvironment in which firms operate are continually in flux and this affects assessment of the performance of new firms ([Derbyshire et al., 2013](#)). Because of sensitivity to initial conditions, it is not possible to know what proportion of firm performance is ontologically random compared to what proportion appears random because of our inability to measure accurately ([Derbyshire et al., 2013](#)). The unpredictable outcomes of complex dynamic processes to which new firms are subject throws into question the certitude with which [Coad et al. \(2015\)](#) state in their clarifications that randomness is 'a considerably better approximation [for firm performance] than determinism'.

3. Summary and reflections

In our view, envisaging firms as Complex Adaptive Systems not only explains failure of decades of entrepreneurship scholarship to uncover clearly the resource factors associated with growth; it also provides a useful lens to explore other patterns such as the stasis-dominated growth paths highlighted in [Derbyshire et al. \(2013\)](#) and [Derbyshire and Garnsey \(2014\)](#) and, now, also in [Coad et al. \(2015\)](#). Factors other than differential resources affect firm performance. They are subject to complex dynamic processes with unpredictable impact. Such systems tend to exhibit long periods of stasis punctuated by sudden qualitative changes in performance as we found in our analysis ([Derbyshire and Garnsey, 2014](#)). This pattern is corroborated by the new analysis provided by [Coad et al. \(2015\)](#) that also finds stasis to be the most common type of growth episode.

The distinction between indeterminate systems and complex adaptive systems where feedback and initial conditions entangle the identification of causes can illuminate the question as to whether agency can be attributed to those founding and managing new firms. If new firms are no more than corks bobbing in a sea of randomness, there is no scope for agency. If new firms are complex adaptive systems, their founders and managers can understand processes at work and take corrective action in response to feedback.

The distinction between the gambling analogy and the perspective that views new firms as complex adaptive systems was in our view the most important aspect of our response to the GRT argument ([Derbyshire and Garnsey, 2014](#)). There is scope for extensive future work elaborating a conceptual framework for analysing firms as complex adaptive systems and examining relevant evidence on the volatility of firm growth but also aiming to use complexity ideas to explain recurring patterns and processes of new firm growth.

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