



Economic crisis and innovation: Is destruction prevailing over accumulation?

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ARTICLE INFO

Article history:

Received 14 October 2010

Received in revised form 19 May 2012

Accepted 3 July 2012

Available online 2 August 2012

Keywords:

Economic crisis

Innovation investment

Community innovation survey

ABSTRACT

The 2008 economic crisis has severely reduced the short-term willingness of firms to invest in innovation. But this reduction has not occurred uniformly and a few firms even increased their investment in spite of the adverse macroeconomic environment. This paper, based on the latest three waves of the UK Community Innovation Survey, compares drivers of innovation investment before and during the crisis. We find that the crisis led to a concentration of innovative activities within a small group of fast growing new firms and those firms already highly innovative before the crisis. The companies in pursuit of more explorative strategies towards new product and market developments are those to cope better with the crisis.

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1. Is the financial crisis bringing gales of creative destruction?

The 2008 financial crisis has severely reduced the short-term willingness of companies to invest in innovation (OECD, 2009; Paunov, 2012; Archibugi and Filippetti, 2011). While on the whole firms' investment in innovation declined during the economic downturn, a small but significant minority of firms are "swimming against the stream" and have increased their expenditures on innovation.¹ Who are these firms that have decided to respond to the crisis by innovating more rather than less? There are two possible scenarios.

- (a) These firms are the most dynamic ones; those that cannot survive without changing their products and services. The competitive advantage of these firms resides in the generation and upgrading of new knowledge, and they innovate continuously, irrespectively of the business cycle.
- (b) Or, alternatively, these firms are new innovators that were not necessarily involved in innovation before the crisis. These firms might be smaller in size or entirely new firms that take advantage of the crisis to contest the market shares of incumbent firms or to launch fresh markets.

Scenario (a) assumes that innovation and technical change are rooted in cumulative learning processes and path-dependent patterns that are woven into organizational routines. This brings persistence in innovative activities, and persistence, in turn, is led by well established firms (Dosi, 1982; Nelson and Winter, 1982; Antonelli, 1997). Scenario (b) is based on the assumption that economic turbulence makes it possible for new and small firms to emerge in a competitive market through innovation (Tushman and Anderson, 1986; Henderson and Clark, 1990; Simonetti, 1996; Freeman and Louca, 2001; Perez, 2002, 2009).

As with most insights in the field of innovation, the two scenarios derive from the theorising of Joseph A. Schumpeter and which Freeman et al. (1982) have labelled Schumpeterian models Mark I and Mark II. Schumpeter and his followers suggested that economic cycles are the consequence of innovation, but also that innovative activities and innovative organisations are re-shaped by economic crises. In particular, we interpret the canonical debate between the two models elaborated by the young and the old Schumpeter in the following way.² During an upswing in the business cycle innovation is carried out in a cumulative fashion. Firms carry out innovation along established technological trajectories and develop into incumbents that accomplish innovation as a routine, also to prevent the entrance of newcomers (Schumpeter, 1942). Following Bell and Pavitt (1993), Pavitt (1999) and Malerba and Orsenigo (1995), we

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¹ For an analysis of the effect of the crisis at the country-level see (Filippetti and Archibugi, 2011).

² For an effective presentation of the innovation models presented by the young Schumpeter in his *Theory of Economic Development* (1911 (1934)) and the old Schumpeter in *Capitalism, Socialism and Democracy* (1942), we draw on Freeman et al. (1982). Schumpeter's monumental analysis of business cycles (1939) was published in between these two works.

call this process *creative accumulation*. An economic turmoil, on the contrary, generates a shakeout in established industries and technological fields; new firms in new sectors play a relatively bigger role than incumbent firms in generating innovations. New firms are eager to exploit new technological opportunities also as a way to challenge incumbent corporations; as the young Schumpeter suggested, “it is not the owner of the stage-coaches who builds railways” (Schumpeter, 1911 (1934)), p. 66. Following Schumpeter, we call this process *creative destruction*.³

The insights from Schumpeter have been enriched by the Neo-Schumpeterian stream of research. Following Nelson and Winter (1982) and Dosi (1982), it emerged that there are important differences across technological regimes and industrial sectors (Malerba and Orsenigo, 1995, 1997). The literature on the persistence of innovation, empirically supported by the analysis of patent data and innovation counts (Geroski et al., 1997; Cefis and Orsenigo, 2001), and innovation survey data (Peters, 2007; Roper and Hewitt-Dundas, 2008; Antonelli et al., 2010), confirmed that there are several industries where the innovators of today were also innovators in the past. But on the whole this literature finds mixed evidence and shows that the cumulative and path-dependent nature of technical change is greater in those firms that (a) devote a substantial budget to R&D and innovation, (b) concentrate on product innovations, and (c) are large in terms of their size.

There are also a number of recent empirical studies that explore firms' innovative behaviour before and during economic recessions. Kanerva and Hollanders (2009), analysing Innobarometer data for Europe, find no association between firm size and decline in investment during 2008. Their results suggest that highly innovative firms continued to invest in innovation also during the downturn. Alvarez et al. (2010), in their analysis of Chilean manufacturing firms, explore firms' responses to the financial crisis of 1998. They find a positive association between firm size and organisational innovations, but no impact of financial constraints on innovation performance during the crisis. In contrast, Antonioli et al. (2010), find that, in their analysis of firms located in Italy's Emilia-Romagna, SMEs were more innovative compared with large firms during the recent crisis. In a firm-based study in eight Latin American countries, Paunov (2012) shows that the current crisis led many firms to stop ongoing innovation projects. The rising financial constraint and the negative demand shock affected the decisions of firms to abandon innovation projects. Further, younger businesses supplying foreign multinationals or suffering export shocks were more likely to stop innovating. Filippetti and Archibugi (2011) explore firms' innovation investment in Europe and find that (a) the crisis brings about a reduction in the willingness of firms to increase innovation investment, and (b) strong national systems of innovation help firms to retain their investment in innovation.

Thanks to a panel dataset we are able in this paper to explore firms' innovation behaviour before and during the crisis. While there is a general consensus on the fact that the most innovative firms are also more likely to persist in innovating, we would like to explore a counter argument. On the one hand, firms with a more agile/flexible structure might take better advantage of changing environments and new market opportunities; on the other hand, firms in more established industries might suspend or abandon ongoing innovation projects to reduce costs. In other words, the unique environment of the current economic crisis might challenge innovation in a cumulative fashion and lead to an environment

more closely related to creative destruction. It is possible, and indeed likely, that the innovators during the crisis differ from those before the crisis. This paper seeks to shed light on this issue by examining the following question: who are the innovators during the economic crisis compared to before the crisis? Answering this question would provide important clues for policy makers.

We address this question by analysing a balanced panel of around 2,500 UK enterprises that responded to the last three waves of the UK version of the Community Innovation Survey (CIS), thus covering for each enterprise the period 2002–2008. The paper is structured as follows. Section 2 introduces our theoretical framework and develops the hypotheses. Section 3 introduces the dataset and methodology. Section 4 presents the results that are discussed in the last section.

2. Is innovation the outcome of knowledge accumulation at the firm level or of the creative destruction in the economy?

The concepts of technological accumulation and creative destruction are at the core of Schumpeter's and Schumpeterian economics. The young Schumpeter looked at innovation as an event that could revolutionise economic life by bringing to the fore new entrepreneurs, new companies and new industries. The mature Schumpeter, on the contrary, observed and described the activities of large, oligopolistic corporations, able to perform R&D and innovation as a routine activity by building on their previous competences.

On the basis of these insights, the Schumpeterian tradition has further investigated the relative importance of the two processes (Nelson and Winter, 1982; Patel and Pavitt, 1994; Breschi et al., 2000). Creative destruction is a regime of low cumulateness and high technological opportunities, where entry and exit in technological areas is easy. Competition among companies is fierce and the role played by entrepreneurial spirits is crucial. Creative accumulation is a regime with high technological cumulateness and low opportunities, leading to a stable environment in which the bulk of innovation is carried out by large and established firms incrementally. The resulting market structure has high entry barriers and oligopolistic competition.

Over the last decades this debate has been enriched by new theoretical developments and empirical research. The interest has shifted from a technological regime/industry-level to a micro-level. This is for two reasons. Firstly, there is increasing awareness that firm-level characteristics play a greater role in shaping innovation activity within technological areas and industries. Secondly, greater availability of micro-data, such as the CIS, has made it possible to investigate empirically firms' heterogeneity in innovation related behaviour. Exploratory empirical studies have shown that there is a great deal of variety in the way firms innovate within industries and within countries (Srholec and Verspagen, 2008; Evangelista and Vezzani, 2010; Frenz and Lambert, 2010).

The focus of this paper is not on specific industries or technological regimes, but on how an exogenous shock, represented by the financial crisis, is affecting firm-level innovation investment. The remainder of this section develops a set of firm-level determinants of innovation investment in the context of the financial crisis. These determinants are examined in view of the changes at the macro-level – before and during the economic downturn – as we aim to understand if, and, if so, through what channels, the economic crisis led to variations/discontinuities at the aggregate level.

2.1. Creative destruction or firm level accumulation?

Those who support the ‘destruction/discontinuous hypothesis’ argue that there are periods of turbulences associated with a change

³ The processes of creative destruction is widely described in Schumpeter's *Theory of Economic Development* (Schumpeter, 1911 (1934)), although the term itself was used for the first time in his *Capitalism, Socialism and Democracy* (Schumpeter, 1942). Paradoxically, the book which introduced the term “creative destruction” vindicated instead the importance of creative accumulation.

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