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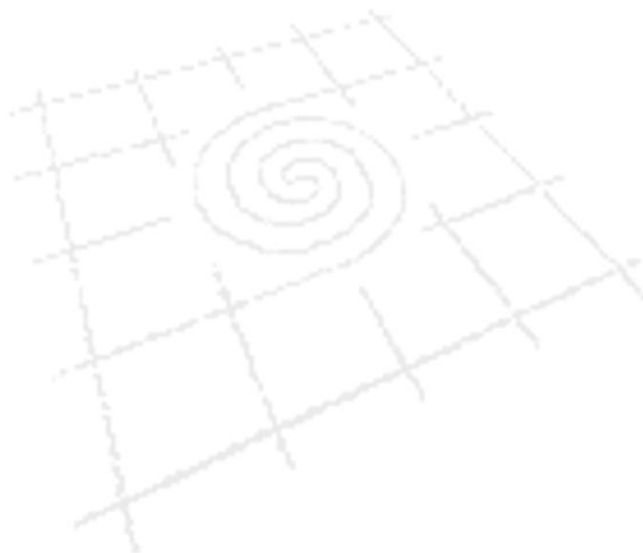
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Adverse Events and Opportunistic Spin-offs: The Irish Biotech Sector

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Abstract

The process of spin-off firm formation exerts a profound impact on industry evolution. One important trigger for spin-off formation is the impact that adverse events such as corporate restructuring or bankruptcy have on organizations. We explore, in the context of the Irish biotechnology industry, the mechanisms by which adverse events lead to spin-off formation. We show that an adverse event may create unanticipated opportunities for those employees who are in a position to exploit them. We contend this manner of spin-off formation does not fit neatly into the existing opportunity/necessity conceptualisation of spin-off formation. Contributions include the extension of existing spin-off typologies to include what we define as “opportunistic spin-offs”; and the identification of instances of adverse events that might lead to “opportunistic spin-offs”.

1. Introduction

The importance of spin-off company formation in perpetuating industry evolution has received great impetus from the work of Steven Klepper of Carnegie Mellon University. Klepper's studies of four established industries (the automobile industry in Detroit, Michigan; the tyre industry in Akron, Ohio; the semiconductor industry in Silicon Valley; and the cotton garment industry in Dhaka, Bangladesh) has placed the process of spin-off formation at the heart of industry evolution. The characterisation of an industry perpetuated by spin-offs, however, does not make explicit the cause of the spin-off process. Two causes of spin-off formation have been identified in the literature: *opportunity* spin-offs, formed in order to pursue new business opportunities (Klepper and Thompson, 2010) and *necessity* spin-offs, which are triggered by an adverse event that renders future employment at the parent firm less attractive or even impossible (Buenstorf, 2009). An adverse event might include corporate restructuring strategies or the break-up of firm in the wake of an anti-trust ruling. This opportunity/necessity spin-off distinction is analogous to the idea of the opportunity/necessity entrepreneur that has emerged in the entrepreneurship literature.

Adverse events such as those referred to above have been seen to exert a profound impact on the evolution of industries. As illustrated most vividly in the case of American Telephone and Telegraph Company (AT&T) throughout the 1980s and 1990s, the break-up and/or restructuring of one firm can unleash a wave of spin-off companies (such as Ameritech, Bell Atlantic, Lucent Technologies – now Alcatel-Lucent, and Verizon Wireless) that themselves subsequently become drivers of innovation and sources of second generation spin-off companies.¹

Despite what may have initially been an adverse event for the parent company, it is questionable whether all spin-offs emerging in such circumstances should be characterised as necessity spin-offs. Lazonick (2004) notes that, while for most employees the consequences of an event such as restructuring will be beyond their control, some management-level employees may be in a position to take the initiative and acquire a product or process unit from the existing corporation (a “management buyout”). It may well be the case that what constitutes an adverse event for the company may not be an adverse event for all employees. The adverse event may actually create unanticipated opportunities (e.g. to acquire IP or R&D assets that can be further developed and commercialised) for those employees who are in a position to exploit them, ultimately leading to the formation of spin-off companies. We contend this manner of spin-off formation does not fit neatly into the existing opportunity/necessity conceptualisation. Instead, we suggest that some of these spin-offs are more accurately depicted as “opportunistic spin-offs”.

¹ Other examples include Roche and Novartis in Switzerland in the 1980s and 1990s (Furher and Messerli, 2011) and Pharmacia in Uppsala, Sweden in the 1990s (Waxell and Malmberg, 2007).

We present a case-study of an Irish biotechnology multinational firm (Elan Corporation) that, in the aftermath of a US Securities Exchange Commission investigation into accounting irregularities, embarked on an unanticipated divestment strategy in order to reduce its debt levels. The rapid sale of intellectual property and product rights that ensued, as well as the divestment of units, unleashed a wave of spin-off creation. These spin-offs, which would be classified as necessity spin-offs in the Buenstorf (2009) terminology, immediately transformed the structure and dynamics of Irish biotechnology industry. However, as illustrated by our case-study, despite the occurrence of this adverse event, not all of these spin-off births can be attributed to necessity on the founder's part.

In this paper we explore, by means of a case study, the following research question: In the wake of adverse events, what are the mechanisms that lead to spin-off formation? Our aim in this regard is to contribute to a more nuanced understanding of the mechanisms of the spin-off process, a theme which is of importance to academics and policymakers alike.

This paper is structured as follows: Section 2 brings together theoretical developments on industry evolution via the spin-off process and recent theoretical contributions on the catalysts for spin-off formation. Section 3 details data sources and definitions and Section 4 provides context for our case-study by outlining the development of the Irish biotechnology industry. Section 5 presents the findings of our case study interviews, while Section 6 concludes and highlights a number of policy implications arising from spin-off formation in the aftermath of corporate restructuring.

2. Literature Review

Explanations of the emergence and subsequent development of industries have become increasingly informed by evolutionary theory (Asheim, Cooke and Martin, 2006). This evolutionary perspective seeks to explain the clustering of industries in terms of the entry, growth, decline and exit of firms, and their locational behaviour (Boschma and Frenken, 2011). The literature on regional and national innovation systems has been particularly influential (Cooke, 2001; Malerba 2003; Lundvall, 1992; Edquist, 2005). These evolutionary approaches to understanding industry evolution and cluster development are characterised by a focus on innovation and learning processes, a historical perspective and an emphasis on the role of institutions and networks. As regards the explanation for the actual clustering process, moving away from a narrow focus on external economies of scale and pecuniary externalities, the evolutionary approach tends to focus on the role of proximity in stimulating information flow and knowledge spillovers. However, recent evolutionary scholarship suggests that such factors may actually play a limited role in driving the initial industrial cluster processes, at least in the early stages, and call for a focus on spin-off processes (Boschma and Wenting, 2007; Ter Wal and Boschma, 2007).

The role of spin-off processes in industry evolution has received a strong impulse from the work of Klepper [Klepper (2002, 2007, 2008, 2010, 2011), Klepper and Sleeper (2005), Buensdorf and Klepper (2009), Mostafa and Klepper (2010)], who shows how organisational reproduction and inherited company traits can influence spin-off processes. Klepper characterises industry evolution as follows: an industry begins from a single firm, often one that has diversified from a related industry; the industry develops over time through a spin-off process as employees from the initial firm establish their own firms; the new firms locate close to where their founders were previously working and living, which in the case of spin-offs lead to a build-up of firms around the early successful producers; high performance parent firms beget high performance spinoffs; these high performance spinoff enable clusters to capture an increasing share of their industry's activity, fuelling growth of clusters and their surrounding regions. In newly evolving industries new firms acquire their competence from firms in related industries and from prior entrants into the industry. In this way, clusters are characterised as emerging from a snowball process of spin-off formation. Spin-offs inherit a large part of their capabilities from their parent (Klepper and Sleeper, 2005; Sapienza et al., 2004), which explains why successful firms tend to give birth to successful firms (Boschma and Frenken, 2011).

Two causes of spin-off formation have been identified in the literature: opportunity spin-offs (Klepper and Thompson, 2010) and necessity spin-offs Buenstorf (2009). Opportunity spin-offs refer to those spin-offs that are formed in pursuit of new business opportunities. Klepper and Thompson (2010) point to a number of distinct models which have been developed offering explanations for the occurrence of intra-industry spin-off processes: (i) an employee makes a serendipitous discovery of some economic value, which the employee implements through his own start-up firm rather than reveal it to his employer (Bankman and Gilson, 1999; Amador and Landier, 2003; Hellman, 2007); (ii) a discovery within the firm is viewed as being less valuable to the incumbent than it would be to a start-up, as to pursue it would exhaust existing rents or require competences not present in the incumbent firm. For example, Cassiman and Ueda (2006) posit that start-up firms may appear to be more "innovative" due to the fact that they are more likely to pursue projects that do not fit with the established firms' existing assets; and (iii) employees exploit, by setting up their own firm, in the same industry, knowledge they gain from successful employers regarding how to compete profitably in their industry, (Franco and Filson, 2006). Klepper and Thompson (2010) provide a further explanation: due to strategic disagreements arising from the inherent difficulties facing decision makers in evaluating new ideas, employees may opt to resign from the incumbent firm and establish new firms in the same industry.

Necessity spin-offs, as developed by Buenstorf (2009), refer to those spin-offs which are triggered by an adverse event, which render future employment at the parent firm less attractive or even impossible. Adverse events might include events such as corporate restructuring, relocation, or bankruptcy of the parent firm. Furthermore, corporate restructuring can take a number of different

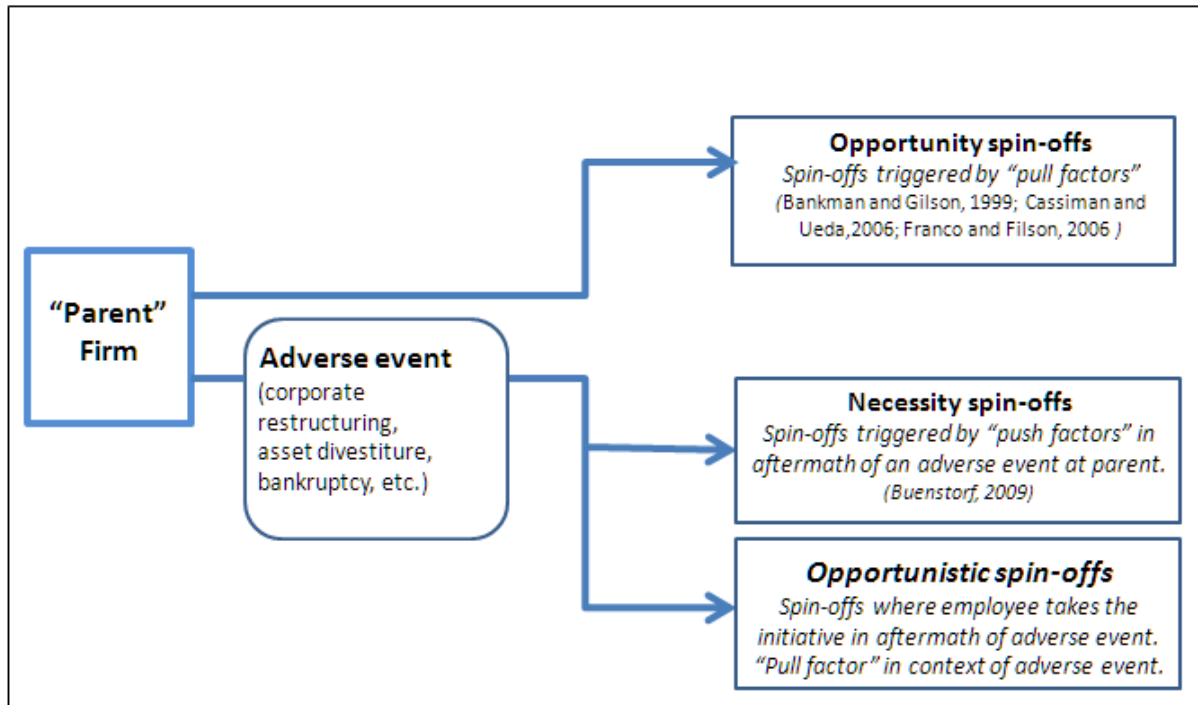
forms (Lazonick, 2004): buy-out, bankruptcy, downsizing, outsourcing, relocation, and divestiture. Buenstorf (2009) goes on to characterise the spin-off process as consisting of three phases of spin-off emergence: (i) employee learning; (ii) a triggering event; and (iii) the formation of capabilities in the new firm. The context of Buenstorf's (2009) study of necessity spin-off formation is the German laser industry over the period 1960-2003. He identifies 48 spin-offs out of a total of 143 entrants over the 43 year period. Spin-offs were categorised as necessity spin-offs where there was substantial evidence that the impetus for their organization was based on events at the parent firm. Of the 13 necessity spin-offs identified, five relate to bankruptcy of the parent firm, seven relate to the parent firm abandoning the laser industry or a specific laser market, and one spin-off was founded by a leading R&D employee of a parent firm. The remaining 28 firms were classified as opportunity spin-offs, where the founders had discovered new opportunities on which to base their business models. No evidence emerged to indicate that the organization of these firms was due to adverse developments at the parent firm.

This distinction between opportunity and necessity as causes of spin-off formation is analogous to the opportunity and necessity entrepreneurship distinction that has emerged in entrepreneurship literature in recent years, as utilised in Wagner and Block (2006). Within the entrepreneurship literature more generally, the concept of opportunity and necessity start-up typically refers to the motivation and/or triggering event around the start-up. For example, the Global Entrepreneurship Monitor and the Panel Study of Entrepreneurial Dynamics (PSED) classify start-ups in terms of responses to the question: 'Are you involved in this start-up to take advantage of a business opportunity or because you have no better choices for work?' In contrast, others study what might be an underlying preference for self-employment, as measured by personality characteristics such as a need for achievement or a propensity to take risks. For some entrepreneurs, the decision to move from employment to self-employment may be the result of a long standing desire for self-employment, reflecting family values or experience of a self-employed parent.

We contend that the causes of spin-off formation observed in the case-study presented in this paper do not fit neatly into the existing opportunity/necessity explanations outlined above. While an adverse event, such as corporate restructuring, asset divestiture, or bankruptcy may be a negative event for the firm in question, it may actually present positive opportunities for individual employees – particularly management-level employees who are in a strong position to take advantage of the parent firm's rapid disposal of assets. However, this situation in which some employees can take the initiative in the aftermath of an adverse event is not captured in the existing theories of opportunity or necessity spin-off formation. We argue that existing theories of the causes of spin-off formation would benefit by explicitly recognizing what we refer to as "opportunistic spin-offs", spin-offs that occur in the wake of an adverse event but where this adverse event does not constitute a "push factor". The entrepreneur does not feel compelled to establish the spin-off but the adverse event created an unexpected

opportunity to engage in entrepreneurship (a “pull factor”). This extension to the existing opportunity/necessity conceptualisation is illustrated in Figure 1.

Figure 1: Causes of spin-off formation



In what follows, we explore the appropriateness of this proposed conceptualisation of the causes of spin-off formation by means of the following research question: In the wake of adverse events, what are the mechanisms that lead to spin-off formation?

3. Data sources and background

Our methodology involves undertaking a set of interviews with the parent company, spin-off companies, industry experts, as well as newspaper and secondary literature analysis. Interviews were undertaken with five Elan executives, founders and senior employees of seven Elan spin-off companies, all of whom were former Elan staff, as well as five industry experts from industrial development agencies and private consultancies. Of the remaining five Elan spin-offs, we were unable to contact three founders as their companies are no longer active and two founders were unavailable for interview. The interviews were semi-structured. Contextual information on each firm was also compiled through secondary literature analysis search, drawing on the *Irish Times* archive and the FAME database.

In order to discuss Elan and its spin-offs in the context of the broader Irish biotechnology industry, we also identify the full population of Irish biotech firms using existing survey material, the list of firms included on the ‘Biotechnology Ireland’ website (hosted by Enterprise Ireland, a government industrial development agency), information from interviews with industry experts, and internet searches (for further detail see: Van Egeraat and Curran, 2012).

We define modern biotechnology as per the OECD’s (2006) definition. The OECD employs a list based definition that includes various techniques and activities: synthesis, manipulation or sequencing of DNA, RNA or protein; cell and tissue culture and engineering; vaccines and immune stimulants; embryo manipulation; fermentation; using plants for clean-up of toxic wastes; gene therapy; bioinformatics, including the construction of databases; and nano-biotechnology.

Regarding the term “spin-off”, it should be noted that multiple definitions exist for the terms spin-off and spin-out (for a discussion see Myint et al., 2006) and the definitional issues are further confused by the fact that the meaning of the two terms tends to be inverted in Europe and the USA. Therefore, we only use the term spin-off and apply a broad definition that covers a wide range of firms, including: (1) firms started as the result of a mother-organisation splitting off existing units or departments and the mother company holding (at least initially) equity stakes in the new firm and (2) firms formed by employees or groups of employees leaving an existing organisation to form an independent start-up firm. The parent entity can be a firm, a higher education institute, or other organisation. In the second case the firm is only considered a spin-off if the employees received some form of assistance/support/stimulation from the parent organisation or if they are based on intellectual property/core capability developed during the employees’ stay at the parent organisation.

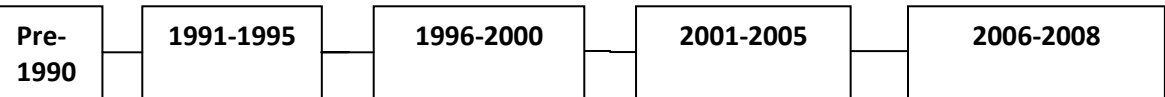
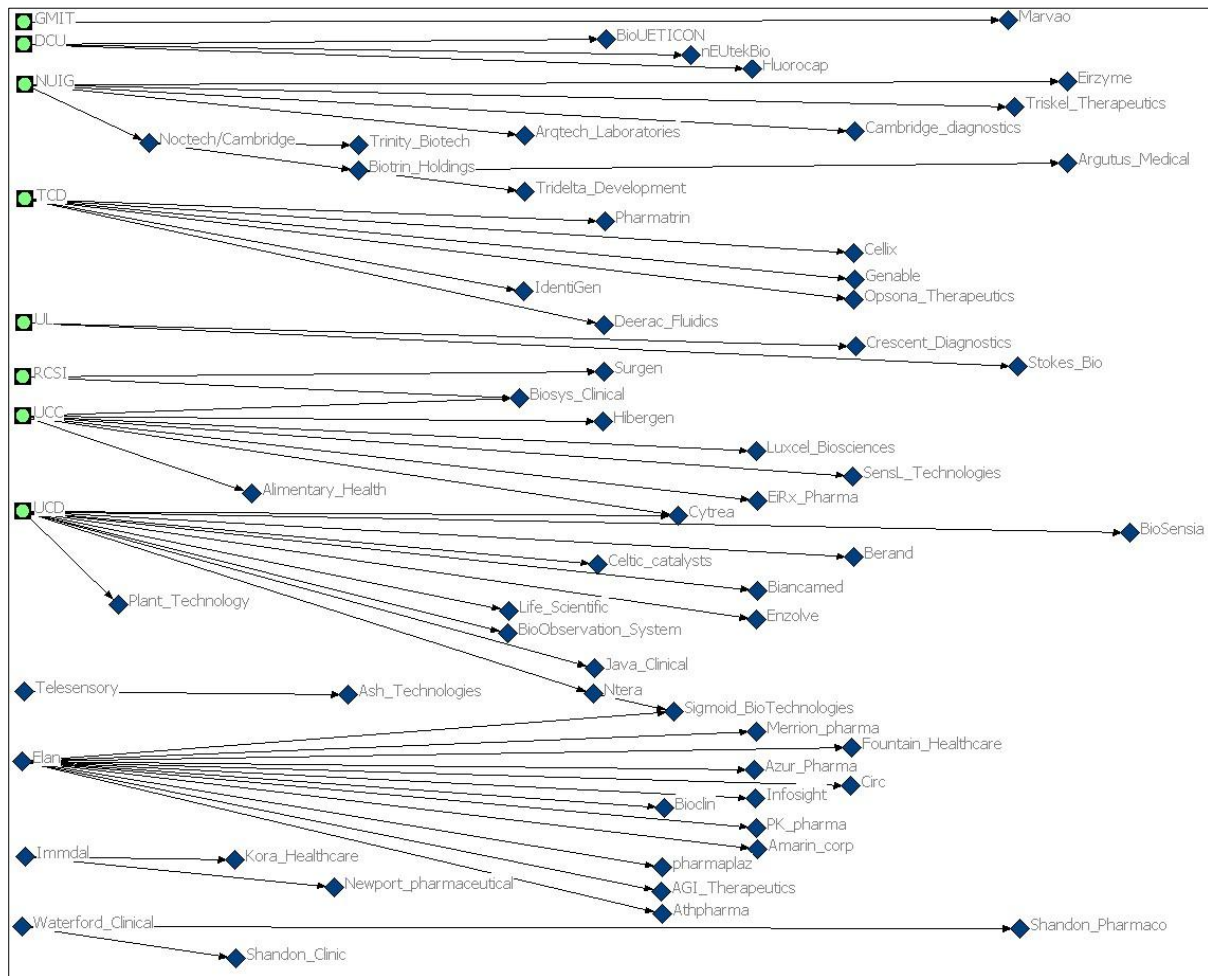
4. Empirical setting: the development of the Irish biotechnology sector

We now outline the development of the Irish biotech industry, by way of context for our case-study. The development of the ‘modern’ biotech sector in Ireland took off in earnest in the 1990s, although substantial employment growth only occurred in the 2000s due to the establishment of a number of foreign-owned biopharmaceutical manufacturing plants. According to our research, by 2009 there were 99 indigenous biotechnology firms in Ireland. In terms of sector, biopharmaceuticals and bio-diagnostics are the largest subsectors, accounting for 64 per cent of firms. Virtually all employment is concentrated in these sub-sectors (Van Egeraat and Curran, 2010). On basis of firm-level data available from the FAME database and reports from industry experts we estimate that the Irish indigenous biotech industry employed just under 3,000 persons in 2009. The majority of indigenous firms are micro-enterprises, employing less than 10 staff. The majority of the university spin-offs are very small, early stage start-up or university campus based firms. Most of the indigenous bio-

pharmaceutical companies are still at an embryonic stage, operating out of university labs, with less than one third of them having brought molecules beyond pre-clinical trials.

The development of the Irish biotech industry has been characterised by two distinct evolutionary processes involving, on the one hand, a series of private sector spin-offs that can be traced back to the founding of Elan, Ireland's largest indigenous biotech multinational, founded more than four decades ago, and, on the other hand, a more recent process of university and private sector spin-off formation which has emerged over the last decade (Curran *et al.*, 2011). Focusing only on spin-offs, Figure 2 presents a more detailed genealogy of the Irish biotech sector, separating indigenous spin-offs in terms of their origins. University and private sector spin-off processes are largely separate processes, with only one spin-off identifiable as having both private sector and university origins. University spin-offs occurred predominantly over the 1996-2004 period, and to a lesser extent over the 2005-2008 period. One firm, Elan Corporation, is clearly the dominant source of private spin-offs, accounting for 12 spin-offs in a relatively short space of time post-2001.

Figure 2: Chronology of indigenous biotechnology Spin-offs, 1990-2008



Notes: Universities denoted by circle-in-box; all companies denoted by diamond. Only indigenous private sector intra-industry spin-offs are included.

Elan Corporation was launched in 1969, when Elan founder, Donald Panoz, moved to Ireland from the United States. He had formerly been the founder of a successful drug delivery firm, Mylan Laboratories, in Pittsburgh. It has been suggested that his choice to set up Elan in Ireland was influenced by the favourable tax regime and less restrictive bureaucracy in place in Ireland.² Originally a specialist in drug delivery systems, Elan initially provided drug absorption control technology for antibiotics produced by other global pharmaceutical companies. By the early 1980s, Elan had secured contracts for the provision of absorption technology for 25 pharmaceutical products from 16 different pharmaceutical companies. While continuing this contracting work, Elan also

² See: <http://www.fundinguniverse.com/company-histories/Elan-Corporation-PLC-Company-History.html>.

further developed its own research and development capabilities, and in 1992 the company became the first to receive Food and Drug Agency (FDA) approval for the transdermal nicotine patch.

In the 1990s Elan's interests extended into the area of neuroscience and the company subsequently undertook the development of its own products for the treatment of Alzheimer's disease, Parkinson's disease, and multiple sclerosis. To facilitate this product development, Elan embarked on an aggressive acquisitions strategy. At the same time, Elan began building a web of strategic partnerships, acquiring minority stakes in a number of companies that in turn paid the company licensing fees for its technology.

However, Elan's stock market value collapsed in 2002 after the US Securities and Exchange Commission launched an investigation into the company's accounting practices. Elan responded by implementing a recovery plan which involved the divesting of a number of subsidiaries and licenses in an effort to drive down debt (*Irish Times*, 29 October 2010). This divestiture of biotechnology assets, accompanied by the departure of a substantial number of executives and scientists from Elan's Irish operations, has led to the emergence of a wave of Irish biotech firms that were either spun off from Elan or formed by former Elan staff. Between 2002 and 2004 alone, ten spin-off firms emerged from Elan and another two followed in 2005 and 2006. Other Elan alumni have dispersed into existing biotech and pharmaceutical firms, as well as into legal and venture capital firms (Sheridan, 2008).

In parallel with the wave of Elan spin-offs, since the mid-1990s, Ireland has witnessed a strong increase in university spin-offs. This development should be linked to a substantial public sector investment over the last 10 years which has significantly improved the biotech research performance of Irish universities. This funding injection has been timely, given the changing organisation of the global biotechnology industry in the post-genome era and the enhanced opportunities for small scale university spin-offs and dedicated biotech firms to explore new avenues of research, into which larger integrated firms are unable or unwilling to allocate resources. In 1998 the Irish government launched the Programme for Research in the Third-Level Institutions (PRTLII) and Science Foundation Ireland (SFI), which since its inception has invested €865 million (including exchequer and private matching funds) into strengthening national research capabilities via investment in human and physical infrastructure.³ The process of technology transfer within Irish universities has also evolved over the last decade. According to Geoghegan and Pontikakis (2008), a significant empowerment of Technology Transfer Offices of the Irish universities has occurred over the last decade, in tandem with a rapid realignment of university research activities.

To summarise, Elan's divestiture of biotechnology assets and product rights, as well as the dispersion of former Elan executives and researchers throughout the Irish biotech industry, fundamentally

³ See www.heai.ie for further details.

changed the trajectory of the Irish biotech industry. Prior to its restructuring (necessitated by an accounting scandal), Elan was characterized by industry analysts as being “*hermetically sealed from the rest of Ireland’s indigenous life sciences industry*” and as operating “*on a different plane compared to the small-scale, undercapitalized ventures that otherwise constituted the sector*” (Sheridan, 2008). A second, distinct process shaping the Irish biotechnology sector over the last decade has been the large-scale public sector investment aimed at developing the biotechnology research capabilities of universities and university spin-offs.

5. Spin-off formation in the aftermath of an adverse event

In this section we investigate, by means of data compiled through our interview process, (i) the structure of Elan at the time of the adverse effect; and (ii) the factors which led to the formation of the spin-off companies.

The parent firm at the time of the adverse event

As noted in the previous section, the adverse event in Elan’s case came in the form a US Securities and Exchange Commission investigation into the company’s accounting practices in 2002. Elan responded by implementing a recovery plan which involved the divesting of a number of subsidiaries and licenses in an effort to drive down debt. Based on our interview findings, the structure of the parent firm at the time of the adverse event is now briefly outlined.

Throughout the 1990s Elan had developed two distinct business interests: its original drug delivery capabilities and the new neurosciences venture, which it had strengthened through acquisitions. Elan’s neuroscience drug discovery and pre-clinical research was primarily carried out in the company’s US-based laboratories in San Diego and San Francisco. The San Francisco facility was established through the acquisition in 1996 of Athena Neurosciences. While Elan Corporation is headquartered in Dublin, Irish involvement was largely confined to the development of drug delivery products in the Elan Drug Technologies unit in Athlone and a small laboratory at Trinity College Dublin. Elan’s Athlone facility, along with its Gainesville (US) site, were the company’s core drug delivery locations.⁴ In Athlone, Elan undertook development work (e.g. pharma co-vigilance and medical affairs) on the historical drug delivery intellectual property and process development work, as well as drug delivery manufacturing and some contract manufacturing for third parties. One Elan executive described the restructuring as follows:

⁴ Elan Drug Technologies unit was subsequently sold to US-based Alkermes in 2011, unit in a deal worth €960 million.

“We find ourselves in a manufacturing relationship with our products, principally due to the restructuring that we had to go through in 2001-2, where we had to do a lot of asset disposal in order to preserve the entity and protect the pipeline for Tysabri and the Alzheimer product. One of the by-products of that process was that a number of products got sold, as well as entities, sites and ... and having sold them we did finish up being the manufacturer”
[Elan executive 1]

However, rather than functioning as a contract manufacturer that produced large volumes of tablets or capsules, Elan sought to incorporate its proprietary technology in third party product development:

“We on the other hand want to apply our technology to the molecule and then protect our IP if you will, by manufacturing that product at a commercial scale and for that we would receive, for example development fees, milestone payments, royalties for the use of our technology and a manufacturing fee.” [Elan executive 1]

Elan’s efforts to restructure saw it embark on a large scale sale of intellectual property, as well as the disposal of subsidiaries, in both its drug delivery and neurosciences business ventures. Another Elan executive described the restructuring process and its impact on the Athlone facilities as follows:

“So we divested the people and some of the early stage development on new delivery technology. What we maintained here was a core competency on drug delivery technology here in Athlone. So development as opposed to research.”[Elan executive 2]

Spin-off formation in the aftermath of the adverse event

Having detailed the underlying drivers for Elan’s implementation of a restructuring strategy, we now focus on the spin-off companies which were formed in the aftermath of this adverse event. Specifically, we draw on our interview data and secondary literature to explore whether or not Elan’s unanticipated divestiture of assets as a “push factor” for the spin-off founders, which lead them to form a spin-off company out of necessity. We present a categorisation of spin-off causes in Table 1, where we distinguish between necessity and opportunistic spin-off formation. Illustrative examples of these causes of spin-off formation are then outlined in more detail. Table 1 also details the activities undertaken by the Elan spin-offs, as well as their origins and current status. We discuss the current status further in Section 6.

Table 1: Elan Spin-off activities and categories of spin-off formation

Company	Function	Origins	Current Status	Category
Spin-off 1	Laboratory testing services	Established in 2002 by two senior managers in R&D development	Acquired by foreign-owned company in 2008.	Opportunistic
Spin-off 2	Product development based on outsourcing of R&D.	Established in 2002 by a former Elan production manager	Dissolved	No data
Spin-off 3	Product development based on outsourcing of R&D.	Established in 2003 by a group of former Elan senior executives.	Acquired by foreign-owned company in 2012.	Opportunistic
Spin-off 4	Consultancy services	Established in 2003 by a former Elan employee.	Dormant	Necessity
Spin-off 5	Analytical services	Established in 2003 by a former Elan employee.	Dormant	No data
Spin-off 6	Drug development	Established in 2003 by a former executive and another biotech entrepreneur.	Active (<10 employees).	No data
Spin-off 7	Integrated company undertaking drug development and commercialization.	Although the company was initially established as an opportunity spin-off in 1989, it was taken over in 2004 by Elan executives in order to commercialise Elan intellectual property. We therefore consider it to be an opportunistic spin-off.	Active (19 employees).	Opportunistic.
Spin-off 8	Drug development	Founded in 2004 by a former Elan vice-president of R&D.	Acquired by another Elan spin-off in 2006.	Opportunistic
Spin-off 9	Initially drug development, now focused on licencing of its existing technologies.	A venture company was established as a vehicle to support the spin-off. IN 2004 a management group consisting for former Elan employees was assembled by the venture capital company in order to purchase Elan intellectual property.	Active (10 employees).	Opportunistic
Spin-off 10	Commercialisation of drugs (no R&D functions).	Established in 2005 by a former Elan senior executive.	Merged with a foreign-owned company in 2012.	Necessity
Spin-off 11	Professional services	Established in 2005 by two former Elan employees.	Active (<10 employees).	Opportunistic
Spin-off 12	Drug development	Established in 2006 by a former Elan senior executive.	Active (<10 employees).	Necessity

Source: Irish Times Archive, various years; Employment data and current status derived from FAME database.

As illustrated in Table 1, we find that at least 50% of Elan spin-offs do not fit the existing classifications of spin-off formation. While they occurred in the context of an adverse event, our study finds that the individuals involved in these spin-offs did not feel compelled to leave the parent firm. Rather, these individuals spoke of opportunities, and of opportunities that arose specifically in the context of the adverse event. It is these spin-offs that we classify as “opportunistic spin-offs”.

Through our interviews, we identify a number of spin-off firms that were formed in circumstances where the causal factor could not be regarded as necessity, but could be more accurately characterised as opportunistic. One such situation is where management level employees found themselves in a position to acquire intellectual property that became available as a result of Elan’s asset divestiture program. In one instance [*Spin-off 9*], a venture company was initially established as a vehicle to support the formation of the spin-off company. The venture capital company then approached a group of former employees in order to assemble a management team that would acquire and develop patents and unfinished R&D assets of the parent company. This acquisition then involved a lump sum payment to the parent company, as well as a stream of royalties based on subsequent revenue generated from the assets. Elan received a minor shareholding in the spin-off and placed one of its employees on the board. This arrangement subsequently facilitated further collaboration between the spin-off and the parent company. In this instance, it was the venture capital company that took the initiative in order to establish a spin-off that would acquire and further develop IP that had been left incomplete due to Elan’s restructuring strategy.

As second situation where the cause of spin-off formation can be attributed to opportunism rather than necessity is where the manager of an in-house unit takes advantage of the opportunity created in the wake of the restructuring to assume control of their unit and establish it as a company in its own right. *Spin-off 1*, a services provider, emerged for the divestiture of an R&D unit of the parent company. The founders had been directors of this unit, which operated as an internal business within the parent company. When the parent decided to close this particular unit, the founders were offered other roles within the organisation, including project management roles. However, the founders declined this offer. The founders believed that the unit closure offered them the opportunity to set up their own business, and they did not consider Elan’s restructuring to be a “push factor”. They developed an outline proposal and approached the parent company with a proposition to lease the pre-existing facilities and equipment. This unprompted approach was welcomed by the parent company, as it ensured that the unit would not be dissolved. In the spin-off company’s first year, it undertook contact work for both the parent company and new clients. After the first year, its client base consisted solely of new clients.

A further situation in which a spin-off is formed out of opportunism rather than necessity arises where senior employees have gained expertise by providing a professional service in-house, that other firms

would not have resources to undertake in-house. When the parent firm's restructuring strategy involves phasing out that particular in-house service, the senior employees in question may be in a position to set up their own company based on their expertise in the provision of that service. This was evident in the case of *Spin-off 11*, a professional services provider, where the founders had gained expertise (through their senior roles within the parent company) in a business function that had previously been undertaken in-house. However, the changing structure of large companies within the industry created an opportunity to profitably provide this function as a stand-alone service to other firms within the industry. Here again, the founders had also been offered other roles within the organisation. However, the parent company's restructuring strategy provided both the impetus and the finance (through redundancy packages) to pursue this opportunity to provide a niche industry service globally.

Our analysis of the spin-off firms also identifies a number of necessity spin-offs. In the cases of Spin-off 10 and Spin-off 12 the interviewee expressly interprets the Elan restructuring as a "push factor". The founder of Spin-off 10, had worked at one of Elan's R&D departments that was going to be completely closed down. The founder received his redundancy package and, over the following 18 months, decided to use this to found a new business venture with other former Elan colleagues. The founder had been a senior figure in the parent company and had cultivated a significant network of international contacts across the industry, which provided the spin-off with useful industry knowledge in its early years.

6. Discussion and Conclusions

This paper contributes to a more nuanced understanding of the mechanisms of the spin-off process by investigating the mechanisms that lead to spin-off formation in the wake of an adverse event. The paper makes a number of contributions. First, we extend the existing categorisations of spin-offs by Klepper and Thompson (2010) and Buenstorf (2009) by demonstrating that the spin-off formation processes that occurred in the case study do not fit neatly into this existing opportunity/necessity typology.

Our case study describes an adverse event that resulted in the 'parent' organisation pursuing strategy of divesting itself of assets and staff. A consequence of the adverse event was 12 spin-offs. At least 50% of these spin-offs do not fit the existing classifications of spin-off formation. While they occurred in the context of an adverse event, our more detailed analysis of the spin-off event and the triggers of the spin-offs suggest that the individuals involved in these spin-offs did not feel compelled to leave the parent firm. Rather, these individuals spoke of opportunities, and of opportunities that arose specifically in the context of the adverse event. It is these spin-offs that we classify as "opportunistic

spin-offs”. We define “opportunistic spin-offs” as spin-offs in the wake of an adverse event where the entrepreneur exploits an unexpected opportunity to engage in entrepreneurship but does not feel compelled to establish the spin-off.

Our second contribution is to identify the circumstances under which an adverse event might result in ‘opportunistic spin-offs’. Our qualitative analysis of an Irish Biotechnology industry case study identifies clear instances in which an adverse event befalling the parent company is not perceived as a “push factor” by spin-off founders. These instances include situations where:

- (i) management level employees find themselves in a position to acquire intellectual property that became available as a result of Elan’s asset divestiture program;
- (ii) the manager of an in-house unit takes advantage of the opportunity created in the wake of the restructuring to assume control of their unit and establish it as an independent company; and
- (iii) senior employees may be in a position to set up their own company based on their expertise in the provision of a niche in-house service, when the parent firm’s restructuring strategy involves phasing out that particular in-house service.

Understanding the processes by which spin-offs occur is important because of the importance of spin-off to the development of industries’ and of industrial clusters. Our analysis of spin-off formation in the wake of an adverse event, such as corporate restructuring, raises a number of issues that impinge upon the policymaking sphere. Our study focuses on an indigenous multinational, which had located corporate, product development, and manufacturing functions in Ireland prior to its restructuring. When the company subsequently engaged in the divestiture of intellectual property assets, these assets remained in the Irish Biotechnology industry by virtue of the spin-off companies created around them. Would these benefits have accrued to the Irish Biotechnology industry had the company been a foreign-owned multinational, with only manufacturing or process development functions located in Ireland?

It is generally thought that events which trigger a wave of spin-off firms have the effect of unleashing a positive entrepreneurial impulse into the indigenous industry. However, as documented in Table 1, the break-up of an indigenous MNC may also have negative consequences for the indigenous industry, as the new spin-offs are gradually acquired by foreign-owned biotech companies. In the case-study presented in this paper, three of the twelve Elan spin-offs were acquired by foreign-owned companies, while one spin-off merged with foreign-owned company. Through this process, the breakup of an indigenous MNC can lead to the indigenous industry being eroded in a piece-meal manner. While the spin-off founders may re-invest the sale proceeds once again in the indigenous industry, this raises the question of whether the process of spin-off acquisition by foreign-owned competitors actually weakens the indigenous industry.

While the spin-offs that emerged from Elan Corporation benefited from their parent company's reputation, replicated much of the parent company's organisational capabilities, and attracted significant flows of venture capital, a number of these spin-out companies exist as "hollow" or "virtual" companies that do not undertake their own R&D. Rather, their strategy is to acquire intellectual property that they could commercialise. While this is perfectly reasonable from a business point of view, it raises questions regarding the nature of the Irish Biotech industry and the extent to which innovative activity is being undertaken within it. Given that the biotechnology industry has been heralded as being vital to Irish economic success, understanding how this industry perpetuates itself is an imperative.

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