R&D MANAGEMENT

Recycling in entrepreneurial ecosystems: the phenomenon of boomeranging

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The 'recycling' of people, capital and ideas is a key process that can support activity in an entrepreneurial ecosystem. Previous research has shown that knowledge recycled from prior employment is important for the entrepreneurial ecosystem and we expand upon this to understand which types of knowledge, as well as individual motivations for transferring this knowledge. We have created a novel dataset to track employee career trajectories within an ecosystem, showing the extent to which employees derive experience from within the ecosystem as well as the extent to which they recycle their entrepreneurial experience by returning to employment. A sample from this dataset participated in semi-structured interviews. The interviews provide early empirical evidence on entrepreneurial recycling through career mobility and development within entrepreneurial ecosystems. In contrast to prior findings of a low prevalence of direct entrepreneurial activity through entrepreneurial recycling, we show a high prevalence of entrepreneurs who have previously worked in the entrepreneurial ecosystem, and that these entrepreneurs often recycle back to employment within the ecosystem. In this process the individuals develop and transfer tangible skills developed in entrepreneurship. This is motivated by a need for regrouping and further developing the tacit knowledge to put them back in a position to seek self-realisation through entrepreneurship. In the process this exposes them to new activities that enable the development of tangible skills and the motivation to regroup once again, and complete the loop of entrepreneurial recycling.

1. Introduction

Research on entrepreneurship and entrepreneurial ecosystems tends to focus on entrepreneurship as a static and binary state – an individual either is an entrepreneur, or they are not. The literature focuses on what happens before (formative factors, triggers, motivations, etc.) and after the entrepreneurial 'moment' (high growth, scaling, firm failure, etc.) but tends to conceptualise this as a threshold moment rather than a dynamic state that can vary over the lifetime of an individual. Entry into entrepreneurship from employment is often seen as a one-way street, with entrepreneurial exit resulting in serial entrepreneurship (DeTienne, 2010), or a recycling of experience and capital through mentorship and angel investment (Mason and Harrison, 2006).

The term 'entrepreneurial recycling' was coined to describe how failure can generate new activity in novel combinations (Bahrami and Evans, 1995). Spigel and Vinodrai (2021, p. 5) present these as a series of flows – dynamic ecosystems rely on individuals moving on from successful and unsuccessful firms alike, to become mentors, investors or skilled workers for other firms, embodying entrepreneurial know-how, and spawning startups and spinouts[1] – all of which feed into the ecosystem, get reconstituted into different ventures (Bahrami and Evans, 1995), that in turn shed and absorb knowledge, people, and investment as they evolve or fail. Spigel (2022) provides evidence of the importance of knowledge gained from employment for subsequent entrepreneurship.

In this paper we address the research gap by looking beyond the path out of employment into entrepreneurship (e.g., Donegan et al., 2019; Spigel, 2022) to better understand the flow of people and knowledge within entrepreneurial ecosystems (Feldman and Lowe, 2015). We trace the entrepreneurial recycling of the Irish population of employees who moved into high-tech employment, and then demonstrate that beyond serial entrepreneurship, mentorship and investment roles, entrepreneurs recycle into a diverse range of actors within the entrepreneurial ecosystems, frequently returning to employment in firms similar to those that they left for their new venture. We term these 'boomerang entrepreneurs' and conduct interviews with a sample across Ireland to understand how the drivers of this entrepreneurial recycling change as individuals move through their careers, and to understand the knowledge they develop and value both pre- and post-entrepreneurship. Our findings contribute to literature on entrepreneurial ecosystems specifically by unpacking the 'generalist knowledge' identified by Spigel (2022) and emphasising the changing importance of different knowledge types as recycling loops between employment and entrepreneurship. In particular, these insights provide more detail about flows of experience through the entrepreneurial recycling loop and the types of knowledge and learning that accompany these flows. We also identify the changing importance of motivations for recycling these types of knowledge. Understanding the changing motivations and knowledge through the recycling process provides insight into how the ecosystem might be enhanced by supporting mobility of talent both into entrepreneurship and into anchor employers within the ecosystem.

2. Entrepreneurial ecosystems, recycling and push and pull factors

2.1. What we know about entrepreneurial ecosystems

The literature on entrepreneurial ecosystems continues to increase rapidly (Alvedalen and Boschma, 2017; Malecki, 2018; Audretsch et al., 2019; Cao and Shi, 2021; Cho et al., 2022; Fernandes and Ferreira, 2022). As a result, numerous systematic literature reviews on entrepreneurial ecosystems have been produced which continue to emphasise the importance of connections between diverse elements (Alvedalen and Boschma, 2017; Cao and Shi, 2021), identified as the configurational approach (Fernandes and Ferreira, 2022) or the relational approach (Theodoraki et al., 2022). However, many reviews conclude that the literature remains undertheorised (Alvedalen and Boschma, 2017; Kansheba and Wald, 2020; Cao and Shi, 2021) and stress the need for longitudinal studies that trace the evolutionary processes within ecosystem (Alvedalen and Boschma, 2017; Malecki, 2018; Cho et al., 2022; Fernandes and Ferreira, 2022), discussed as the dynamic (Shwetzer et al., 2019; Bertello et al., 2022) or evolutionary approach (Mack and Meyer, 2016; Roundy et al., 2018; Haarhaus et al., 2020).

Discussion of entrepreneurial ecosystems initially focused on the essential ingredients, e.g., talent, knowledge, supports etc., while ignoring the process by which these ingredients are combined (Mack and Mayer, 2016; Roundy, 2017; Allahar and Sookram, 2019). The process depends on the set of flows or relations within an entrepreneurial ecosystem, which change over time. Key relations may also include flows to and from places outside the ecosystem. While placing an emphasis on the flows between a multitude of interconnected elements, the entrepreneurial ecosystem perspective also places the entrepreneur in a central role, particularly those involved in high growth ventures (Acs et al., 2017; Alvedalen and Boschma, 2017; Brown and Mason, 2017; Stam and Spigel, 2017). The entrepreneurial ecosystem approach suggests that more flows lead to a more connected and resilient region (Spigel and Harrison, 2018) although recent evidence (Spigel, 2022) indicates that flows may be directed to sectorally nested ecosystems with little overlap, rather than a single, connected ecosystem. Spigel (2022) shows that entrepreneurial ecosystems benefit from entrepreneurs' knowledge stemming from employment in general management and

suggests that future research should examine the detailed knowledge base of entrepreneurs at an individual level.

Entrepreneurs have selected career paths that are distinctly different from their non-entrepreneurial counterparts. Donegan et al. (2019) propose that prior employment imprints nascent entrepreneurs with logics for organising startups. Within an ecosystem, entrepreneurs with different employment backgrounds pursue alternative entrepreneurial pathways, each generating distinct, though complementary, regional impacts. One of the key evolutionary processes of ecosystems is entrepreneurial recycling: the 'fluidity' of resources like people, skills, knowledge, and capital that move between different firms within an ecosystem (Bahrami and Evans, 1995; Mason and Harrison, 2006; Spigel and Harrison, 2018; Spigel and Vinodrai, 2021). Spigel and Vinodrai (2021, p. 5) present evidence of entrepreneurial recycling as employee mobility into startup and scaling firms in the infrequent event of failing anchor/'blockbuster' firms in a region, to which we add (in bold in Figure 1 below) the more frequently occurring failed and acquired entrepreneurial firms described by Bahrami and Evans (1995), and the resulting potential flows of entrepreneurial know-how from these entrepreneurial firms into other firms.

By adding this flow from frequent entrepreneurial exit to the processes of entrepreneurial recycling, we attempt to shift the emphasis from a linear transfer of knowledge and experience through rare blockbuster events into a continuous process of employee mobility where feedback loops can ensure that the entrepreneurial knowledge and experience gained in the entrepreneurial ecosystem can be repeatedly recycled. Understanding what drives the individual mobility decisions to transition back and forth between employment and entrepreneurial roles within the same ecosystem adds to literature on entrepreneurship but also depth to research on ecosystem dynamics.

2.2. *Drivers of entrepreneurial recycling*

Much has been written about what motivates an individual to move into entrepreneurship due to different career and lifestyle triggers. Dawson and Henley (2012) explain that redundancy often stimulates entrepreneurial motivations and can also be associated with changes in external conditions that are both favourable (cheaper start-up costs) and unfavourable (weaker local demand). Family-related factors have been found to be important: such as combining waged and domestic labour; family policies and family obligations; fit with domestic commitments; and a desire for work-family balance (Verheul et al., 2006; Jennings and McDougald, 2007; Kirkwood and Tootell, 2008).

Entrepreneurship scholars also highlight the need to learn the 'push' and 'pull' sides of entrepreneurship decisions from the perspectives of both personal career history of entrepreneurs and the larger

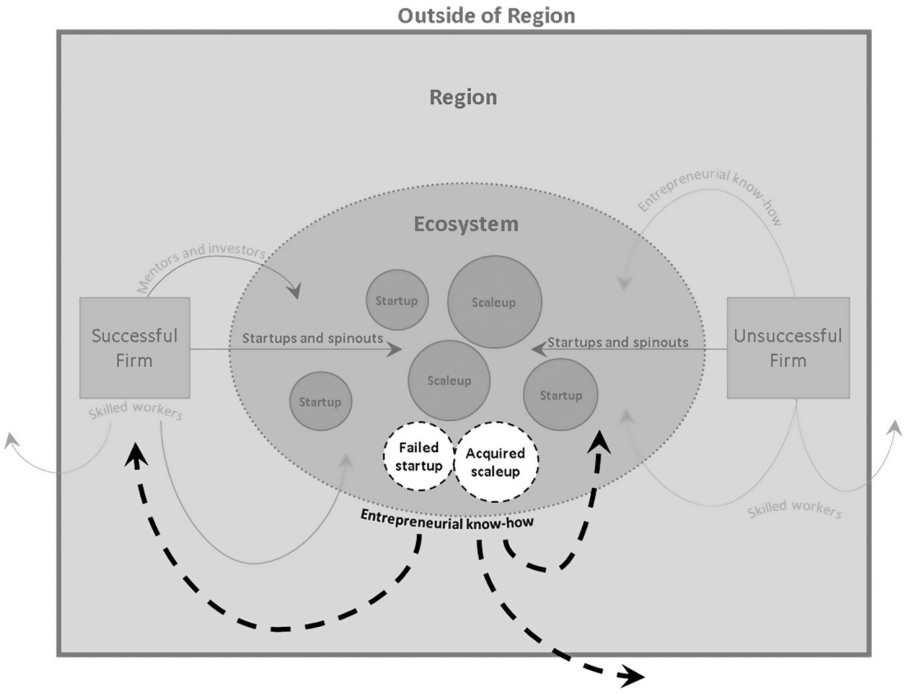

Figure 1. The closed loop of entrepreneurial recycling within entrepreneurial ecosystems. *Source*: Adapted from Spigel and Vinodrai (2021).

employment context (Hytti, 2005; Patterson and Mavin, 2009; Dawson and Henley, 2012). Indeed, Kirkwood (2009) explains that the primary theory development around entrepreneurial motivations has been to classify motivations into categories of push and pull factors. A variety of terms have been used, including 'push', 'pull', 'necessity', 'opportunity-based' 'lifestyle/family' (Gilad and Levine, 1986; Amit and Muller, 1994; Hughes, 2003; Thurik et al., 2008). Amit and Muller (1994) propose that push entrepreneurs are those whose dissatisfaction with their current position, for various reasons unrelated to their entrepreneurial characteristics, pushes them to start a venture. Whereas pull entrepreneurs are lured by their new venture idea and initiate venture activity because of the attractiveness of the business idea and its personal implications. We provide an overview of the literature in Table 1 and a then a discussion section before the presentation of our conceptual framework.

Pull factors are those that draw people to entrepreneurship. Pull factors include task demand factors such as looking for a challenge, antecedent factors such as always wanting to be an entrepreneur; perceived career fit both on a personal ability and a prior experiential level. Other pull factors include issues associated with job security, family, and lifestyle. The literature (Gatewood et al., 1995; Feldman and Bolino, 2000; Douglas and Shepherd, Douglas and Shepherd, 2002; Hayter, 2015) has examined the extent to which internal motivations, a perceived desire for autonomy or independence are the key motivating factor for entrepreneurs. Deterioration in current job satisfaction may promote a perceived need for independence (Nooderhaven et al., 2004). The need for independence may drive movement into entrepreneurship, perhaps as late as after retirement (Kerr and Armstrong-Stassen, 2011; Stephens and Hegarty, 2022), and is important for the relationship between entrepreneurial mentoring and entrepreneurial intentions (Baluku et al., 2019).

The literature (Peel and Inkson, 2004; Terjersen, 2005; Schjoedt and Shaver, 2007; Taormina and Lao, 2007) reports a range of push (factors that provide momentum towards employment) and pull factors (those that draw people to employment) associated with socialisation, influences, networks, values and self-efficacy and task-perceptions. Zhao and Seibert (2006) explain that entrepreneurs have different personality traits than corporate managers, scoring far higher on traits such as openness to experience (curiosity, innovation) and conscientiousness (self-discipline, motivation) and considerably lower on neuroticism, which allows them to better tolerate stress. In contrast Dawson and Henley (2012) report that individuals may choose to be self-employed for many different reasons. At one end of the spectrum the decision to pursue entrepreneurship may be driven by self-efficacy and/or opportunity recognition. While at the other end of the spectrum, self-employment may be the result of being unable to find appropriate paid employment often caused by adverse economic conditions. Indeed, idiosyncrasies exist in the characteristics of new business creation such that what may be an opportunity for one might be a necessity to another (Giacomin et al., 2010).

Table 1. Push and pull factors

Author (year)	Push/pull	Key factors
Nooderhaven et al. (2004)	Push	Being dissatisfied with aspects of one's job(s)
Rotefoss and Kolvereid (2005)	Push	Location
Dobrev and Barnett (2005); Jennings and McDougald (2007)	Push	Undesirable work conditions
Verheul et al. (2006); Jennings and McDougald (2007); de Bruin et al. (2007); Kirkwood and Tootell (2008)	Push	Family circumstances
Dobrev and Barnett (2005); Rotefoss and Kolvereid (2005)	Push	A lack of challenge or scope for progression
Dawson and Henley (2012)	Push	Economic problems
Gatewood et al. (1995); Feldman and Bolino (2000); Douglas and Shepherd (2002); Smeaton (2003)	Pull	Desire for autonomy or independence
McClelland (1961); Dennis (1996); Alstete (2003); Wilson et al. (2004); Kirby (2004); Cassar (2007); Di Zhang and Bruning (2011)	Pull	Need for achievement, desire for success
Clark and Drinkwater (2000); Alstete (2003); Wilson et al. (2004)	Pull	Monetary motivations
Burton et al. (2002); Davidsson and Honig (2003); Kuratko (2005); Tang et al. (2012); Singh and Rao (2016); Hsu et al. (2017); Hsieh et al. (2018)	Pull	Opportunity recognition

Entrepreneurs often recognise opportunities and innovative ideas through their experience and skills (Bygrave and Zacharakis, 2014), and the knowledge they already have (Singh and Rao, 2016). Like entrepreneurial experience, industry experience is vital in the creation of new ventures as it can provide knowledge, skills and personal connections to the entrepreneur (Davidsson and Honig, 2003). There are two significant benefits of prior experience as proposed by Burton et al. (2002). First, founders that have prior industry experience have an increased probability of accessing external finance. Second, entrepreneurs seem to benefit from experience in related industries which influences the entrepreneurial process (Tang et al., 2012; Hsu et al., 2017; Hsieh et al., 2018), which in turn impacts the entrepreneurial ecosystem development by transferring know-how, organisational insights and cultural awareness (Donegan et al., 2019).

Based on our review of the literature we constructed the conceptual framework presented in Figure 2.

The framework captures a sequence of first, entering employment based on a combination of push and pull factors. This is followed by movement in cycle of entrepreneurship, accounting for potential serial entrepreneurship. The diagram then reflects that that the cycle of entrepreneurship ends with progression into retirement, mentoring or investment due to entrepreneurial exit or failure. The figure, presented as a linear flow of career progression, reflects entrepreneurial recycling as an inflow of knowledge and skills into entrepreneurial activity, and then a second phase of entrepreneurial recycling into retirement, mentorship.

We explore the career histories of entrepreneurs to understand the prevalence of these two steps of entrepreneurial recycling, and interview entrepreneurs to explore the degree to which these push and pull factors shaped their career trajectories. Our aim is to understand the motivations for entrepreneurial recycling as well as trace the development of the knowledge and skills recycled in the first step as compared to those recycled in the second step. These insights add to the research gap identified (Spigel and Vinodrai, 2021; Spigel, 2022) providing more detail particularly about flows of experience through the entrepreneurial recycling loop and the types of knowledge and learning that accompany these flows.

3. Methods

We conducted an in-depth study of Ireland's high-tech entrepreneurs to understand the dynamics of entrepreneurial recycling within entrepreneurial ecosystems. A high-tech setting was chosen because it is highly appropriate for examining aspects of knowledge and entrepreneurship (Corbett, 2007; Marvel, 2013). Ireland is an interesting context because it has created an institutional environment that has attracted EMEA headquarters for most global software, medtech, pharma and industrial automation firms (IDA Ireland, 2021), and Dublin is listed as a top startup ecosystem (Startup Genome, 2020).

3.1. Data and methodology

Spigel and Vinodrai (2021) highlight the paucity of data on employee mobility and their interactions with the entrepreneurial ecosystem and argue for using career based social media platforms to provide data at the individual level. Similarly, Credit et al. (2018) suggest that quantifying certain aspects of the entrepreneurial ecosystem can be achieved through social media data. However, although social media data can provide a good understanding of the prevalence of employment mobility and movement into and out of entrepreneurship, it does not provide us with an understanding of what entrepreneurs recycle when moving within the entrepreneurial ecosystem, nor why they make these moves. Therefore, career

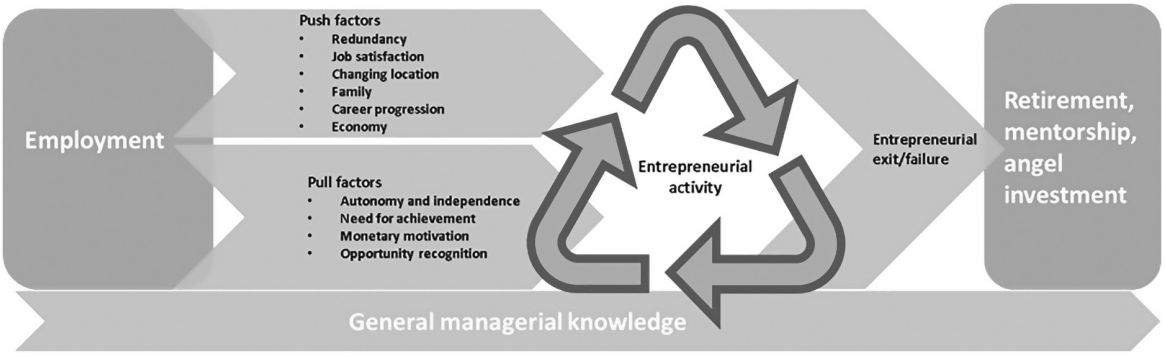

Figure 2. Emergent conceptual framework of career progression in entrepreneurial ecosystems.

data from social media are supplemented with in depth interviews from entrepreneurs that exhibited mobility between large firms and entrepreneurship, and entrepreneurship and large firms. Qualitative approaches are particularly useful in areas that are not well advanced theoretically.

Using a firm directory of high-tech firms in Ireland (TechIreland), we identified 2216 individuals who were Irish high-tech entrepreneurs in 2018. In the population of Irish high-tech entrepreneurs, 86% are male and 66% located their high-tech firm in Dublin, while 18% were located in three other major Irish cities (Cork, Galway and Limerick) and 16% were located outside major Irish cities. Over 70% of the high-tech firms were IT related, while the second most common sector, health and medical, comprised 15% of high-tech firms.

Career history data was identified for 2038 entrepreneurs with active profiles on LinkedIn in 2020. Less than 6% of high-tech entrepreneurs in Ireland had no prior employment experience identified and on average, high-tech entrepreneurs had employment experience in 5 roles for an average of 4 years, prior to their high-tech venture. We categorised their immediate employment prior to new venture creation, as well as their subsequent employment, according to types of organisations typically considered in the entrepreneurial ecosystems literature (Stam and van de Ven, 2021). This was done by matching employer names to Irish organisation directories for venture capital, higher education institutes (HEI), multinational high-tech firms, hubs and accelerators, large corporates and indigenous high-tech firms. Prior and subsequent employment in consulting within Ireland was identified using employment titles and organisation names, future research may expand this to better understand the role of 'support services' such as lawyers, tax accountants, accountants, suppliers (Neck et al., 2004; Cohen, 2006; Stam and van de Ven, 2021) in entrepreneurial recycling. Prior employment in the Irish ecosystem was identified for 1403 (69%) high-tech entrepreneurs (Table 2).

Of the high-tech entrepreneurs with prior employment in the Irish ecosystem, 766 (55%) remained in their high-tech venture and 29 (2%) no longer had social media career profiles. A Chi squared test was conducted on the differences between the employer organisation types for those entrepreneurs that had left their venture, those that stayed in their venture, and those that had removed their career profiles. No significant differences in the proportions of prior employer types were found between these three groups indicating that there is no evidence of survivorship bias based on prior employer type in the data.

Finally, three high-tech entrepreneurs with prior employment in the Irish ecosystem had indicated retirement and 50 (8%) had moved into employment with employers not typically considered in the entrepreneurial ecosystems literature (Other). Therefore, we identified 555 (91%) high-tech entrepreneurs with prior employment in the Irish ecosystem who then transitioned back to employment within the Irish ecosystem.

Our analysis shows the breakdown of these 555 paths through high-tech entrepreneurship. Based on this analysis we identified that multinational high-tech firm employment, both before and after entrepreneurship, was the most common entrepreneurial recycling flow in the ecosystem after those who perpetuated the loop of serial entrepreneurship. We used this analysis to identify 59 who had experienced the flow both into entrepreneurship from employment in multinational tech firms in the ecosystem, and within the three year study period, transitioned back out of entrepreneurship into employment in multinational tech firms in the ecosystem. We selected this small but important sample of high-tech entrepreneurs primarily because it was the most prevalent pathway through entrepreneurship, beyond serial entrepreneurship. These boomerang entrepreneurs are an important source of information because they can reflect on the paths both to and from entrepreneurship which enables an understanding of the differences in motivations and knowledge employed in entrepreneurial recycling.

Table 2. Career data availability on high-tech entrepreneurs' prior and subsequent employment

	Subsequent employer						
	Exited venture				Continued in venture	Unknown	Total
Prior employer	Irish ecosystem	Other	Retired	Total			
Irish ecosystem	555	50	3	608	766	29	1403
Other	199	76	1	276	388	32	696
Unknown	14	4		18	92	7	117
Total	768	130	4	902	1246	68	2216

Source: Authors' calculations.

We interviewed fifteen boomerang entrepreneurs (Table 3), proportionally representative of the population across gender, sector and location, to better understand their motivations and knowledge employed in each phase of their career. The interviews were conducted online during July and August 2020. The interviews ranged in time from 45 min to one hour.

The participants varied in age from 28 to 50, with 11 males and 4 females. Five had completed second level education, seven had a degree and three at undertaken postgraduate study. There is a diverse range of industry roles initially taken by the participants with sales and technical orientated roles being the most common. The entrepreneurial activities are also diverse with the pursuit of technical solutions to industry problems or following a passion the most common. Finally, the majority of participants are now employed in senior management roles characterised by a large amount of autonomy.

In this paper, the issue of credibility and transferability was addressed in three main ways (Kirkwood, 2009): using convergent interviews, selecting quotes and contrary cases, and in the use of tabulations. Reliability was assured by taking extensive field notes, and by digitally recording the interviews. Brush et al. (2009) argue that exploring the entrepreneurial narrative can make a unique contribution to our understanding of the phenomenon. Smith (2009) explains that to be made meaningful for others, experiences, values, and achievements must be communicated to others *via* language, narrative and storytelling. Therefore, narrative structuring (Kvale, 1996) was used to create a coherent story of the entrepreneurs' experiences, and the semi-structured interview schedule followed the chronological sequence of their careers. In adopting this approach, our study follows the advice from Roundy (2016) and pays attention to the voice of the entrepreneurs. Using a step-by-step interpretative analysis, the data were analysed individually by two authors and, subsequently, their interpretations were discussed among all members of the research team.

4. Recycling and labour market transitions

4.1. Descriptive results

Based on the 555 high-tech entrepreneurs with prior and subsequent employment in the entrepreneurial ecosystem, we developed an alluvial graph (Figure 3) to reflect the linear process (Figure 2) into and out of entrepreneurship. On the left, the bands represent the prior employer type of each high-tech entrepreneur. These bands flow into their post-entrepreneurial employer type. Horizontal pathways, which comprise the three largest bands, reflect an employment pathway through entrepreneurship that starts and ends with same employer type in the ecosystem. While the loop of serial entrepreneurship, in line with Bahrami and Evans' (1995) description of entrepreneurial recycling, is indeed the most frequent career path for

Table 3. Profile of boomerang entrepreneurs interviewed

#	Age	Gender	Education	Industry (1)	Business	Industry (2)
1	34	Male	2nd Level	Sales	Property Management	Sales
2	40	Male	Degree	Stock Trader	App Dev	Product Dev
3	35	Male	DBA	Programmer	Consultancy	Product Dev
4	30	Male	Degree	Accountancy	Booking Website	Product Dev
5	42	Male	2nd Level	Sales	Festival Management	Recruitment
6	38	Male	2nd Level	Sales	Beauty	Accountancy
7	28	Male	Degree	Finance	Health Tech	Product Dev
8	34	Male	2nd Level	Wed Design	Web Analytics	Product Dev
9	35	Female	DBA	Software Dev	Educational Resources	Partnership Manager
10	50	Male	2nd Level	Sales	Medical App	Property Sales
11	35	Male	Degree	Manufacturing	Capital Markets	Product Dev
12	40	Female	Masters	Admin	Computer Games	Broadcasting
13	30	Female	Degree	Web Design	Health Food	Branding
14	30	Female	Degree	Manufacturing	Health Tech	Product Dev
15	40	Male	Degree	Programmer	Online recruitment	Partnership Manager

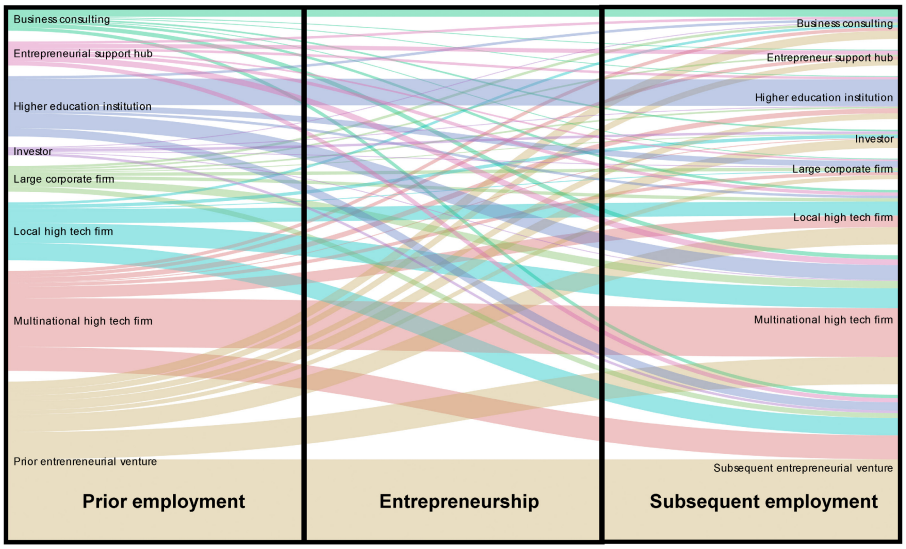

Figure 3. Alluvial diagram of paths through high-tech entrepreneurship.

high-tech entrepreneurs (see the bottom horizontal path in Figure 3), evidence is provided of the complex interactions, beyond serial entrepreneurship, corporate spinouts and university spinoffs, as anticipated by the ecosystem literature. These combinations are represented by diagonal pathways in the alluvial diagram. Almost all combinations of paths through high-tech entrepreneurship were evident in Ireland and there are significant differences in the frequency of the pathways from employment organisation types through high-tech entrepreneurship and back to employment in the Irish ecosystem.

The three most frequent pathways are all loops that start and return to the same type of organisation in the Irish ecosystem. In Table 4 these are seen as serial entrepreneurship (n = 99), corporate spinouts followed by a return to multinational high-tech employment (n = 59), and university spinoffs followed by a return to HEI employment (n = 32).

Of the three boomerang paths through entrepreneurship, serial entrepreneurship is a well-studied phenomenon and reflects Bahrami and Evans' (1995) conceptualisation of entrepreneurial recycling. Mobility from HEI employment into entrepreneurship is well studied under the university spinout literature, and further investigation into the profiles of these 32 high-tech entrepreneurs suggest that most HEI employees did not leave HEI employment when they started their venture, but rather engaged in 'hybrid entrepreneurship' (Schulz et al., 2016; Viljamaa et al., 2017; Pollack et al., 2019; Ferreira, 2020). This is explained by HEIs offering institutional support for university spinoffs by, for example, allowing employees to retain their positions and wages (Meoli and Vismara, 2016). Conversely, private firms take active measures to limit knowledge spillovers of intellectual property through employee mobility. Corporate spinouts typically do not receive institutional support due to productivity and intellectual property concerns (Goossen and Carnabuci, 2020), and corporates can be hesitant to hire employees where they anticipate knowledge spillovers (Bae and Lee, 2020). Since knowledge and entrepreneurship are best examined in a high-tech setting (Corbett, 2007; Marvel, 2013), we focus on prior and subsequent employment in multinational high-tech firms. Therefore, subsequent analysis in focussed on the frequently occurring boomerang path from employment in multinational high-tech firms, through high-tech entrepreneurship and back to a multinational high-tech firm.

Further analysis focusses on the changing motivations for following a boomerang path through high-tech entrepreneurship and the knowledge and experience which boomerang entrepreneurs recycle in the entrepreneurial ecosystem while progressing along this path.

4.2. *Boomeranging in an entrepreneurial ecosystem*

We begin our analysis with an overview of the key push and pull factors that were reported by the participants (Table 5).

During the first phase the most significant factors are: to start a career; and work in a proximity to their current location. The most common means

Table 4. Prior and subsequent employers of high-tech entrepreneurs in Ireland

	Subsequent employer								
Prior employer	Serial entrepreneurship	Business consulting	HEI	Hub	Investor	Large corporate	Local tech	Multinational high-tech firm	Total
Business consulting	4	11	1	1	2	1	3	5	28
HEI	10	3	32			7	3	18	73
Hub	5	3	3	5		2	4	7	29
Investor	3	1	1		3	1		1	10
Large Corporate	6	3	2	2	1	4	4	9	31
Local tech	21	3			4	1	17	24	70
Multinational high-tech firm	29	4	6	4	1	4	14	59	121
Prior entrepreneurial venture	99	10	7	7	11	5	21	33	193
Total	177	38	52	19	22	25	66	156	555

Source: Authors' calculations.

Table 5. Frequency of push and pull factors

Phase	Family	Security	Career	Burnout	Economy	Location	Satisfaction	Peers	Opportunity	Flexibility	Passion
Prior employment	2	2	10		3	11	2	6		1	2
High-tech entrepreneurship	7	3	4		4	2	5	3	11	4	12
Subsequent employment	11	14	9	10	6	5	7			5	1

of accessing employment was *via* a peer group. In the second phase there is a shift to two key factors: opportunity recognition and the desire to pursue a passion. Finally, in the third phase there is a further change with three key factors emerging: family circumstances; the desire for job/income security and in ten cases suffering from burnout resulting from the often time-consuming and intense nature of entrepreneurship.

4.2.1. *Prior employment in the entrepreneurial ecosystem*

Illustrated by Table 6, many of the participants report that during the first phase work was secured *via* family or peer-based connections. For many there was no clear strategy or decision-making process other than the need/desire to obtain an income. These represent push and pull factors related to convenience that is chosen not for the employment activity or organisation, but rather as as convenient way to regroup after a being a student or being involved in some other diversionary career event such as a project coming to an end.

Employment delivered a range of experience on which the potential entrepreneurs drew when making the move into entrepreneurship (Table 7).

Several employees reported that while employed at high-tech multinational firms, they gained tacit knowledge about the entrepreneurial process. For example, interviewees described the access they had to their high-tech multinational employers' entrepreneurial journey and evolution in terms of organisational structure. Other tacit knowledge that employees took from their employment into entrepreneurship included work discipline and creativity. For those in technical roles such as software development, tangible skills such as project management or team management that they developed during employment were used in their role as entrepreneurs:

4.2.2. *High-tech entrepreneurship*

The key motivations to become an entrepreneur within the ecosystem were: lack of progression opportunities; repetitive nature of the work; frustration at selling other people's products and services; corporate culture; opportunity recognition; product/service development linked to a passion or hobby; and/or the desire to pursue entrepreneurship (Table 8). Most participants indicated that the transition to high-tech entrepreneurship was a gradual accumulation of factors that had been building over time rather than the result of a discrete trigger event.

Together, these factors highlight that entrepreneurs were, in different ways, dramatically increasing the level of agency in their professional lives, following the regrouping phase, in a phase of self-realisation. For some this was motivated by the challenges of a particular problem that they were not able to engage with while employed, while for others it was the opportunity to pursue a career more aligned to their family or financial aspirations. This is reflected in the findings from the third phase, where employees sought to return to employment, almost always in positions of seniority, greater autonomy and financial security. On returning to employment, they took with them knowledge and experience developed as entrepreneurs and sought by employers.

Some interviewees described how they were actively recruited back into employment for tacit knowledge developed during their startup experience. While others described how tangible skills (Table 9) they had developed during entrepreneurship were valued by their subsequent high-tech employer:

Table 6. Illustrative coding of push and pull factors into prior employment of high-tech entrepreneurs

Research question	Illustrative quotes	Coding	Push or pull factor	2nd order coding
What are the push and pull factors that drive initial career decisions in high-tech industries?	*They look after your masters [degree]. They give you a bit of love, like a signing on bonus. As a 19 year old, I could not say no.*	Income	Pull: economic	Convenience
	A friend worked there and I was just out of college, so that was easy.	Family and friends	Pull: networks	
	I came back to Ireland to visit my mother and within a week I had found a job, so I decided to work at [high-tech firm] in Dublin.			
	I went to [high-tech company] as part of an internship for 7 months, and then they offered me a job while I was in fourth year [of university]. I took them up on their offer.	Education employer linkages	Push: networks	

Table 7. Illustrative coding of knowledge and experience developed in prior employment and utilised in high-tech entrepreneurship

Research question	Illustrative quotes	Coding	Knowledge	2nd order coding
What experience do these individuals draw on as they transition into high-tech entrepreneurship?	*They have an internal wiki and are all about content, so I would spend half an hour to an hour a day watching videos about the CEOs and founders, about how they would go about making [high-tech IT firm], creating the company and improving it. And then I thought, 'I cannot work here anymore, we are going to start our own company.'* *The biggest contributing factor for my knowledge base on how to create a successful company came from my experience at [high-tech firm]. In terms of why, it's because of how much they share about their journey, what's fed into their success and the way they approach leadership. In terms of culture, there was a great culture of collaboration, responsibility and ownership of success, and giving you enough rope to hang yourself in terms of making enough mistakes to learn how to do things the right way.* *One of the good things when you leave is you can take all of the things that were incredibly hard to do, and apply some of it from the get go and in smaller scaling organisations, apply it much more easily. … You could understand, this is the culture and ethos we should have from the get go.*	New venture creation knowledge	Organisational know-how	Tacit knowledge
	Any experience you have in life, there are going to be certain skills that are transferable. I definitely relied on some of the skills I built up in the [high-tech firm] in my startup. So, organisation, discipline, because we are working to deadlines constantly. Being able to set a deadline and work towards that is so important, especially in the startup world, when you are on a project and you have nobody chasing you – it's all you. *I used my corporate experience in the companies that I built, and it's not always applicable, but some things might be. A thing that I find is helpful for me is that when you are rotating in the same circle of ideas, it makes you closed and difficult to brainstorm outside this circle. But if you have experience somewhere else, it will help you to think slightly differently and helps your venture get somewhere different rather than produce the same ideas as other startups.*	Discipline and work ethic	Entrepreneurial mindset	Tacit knowledge
	I was given a lot of opportunities to lead projects in [high-tech company], so that helped me a huge amount [in my startup]. *I worked with [high-tech firm] as cofounder of a team for their development platform. … So that journey I would definitely liken to establishing or founding a company, given having later founded my company.*	Management and leadership	Business skills	Tangible skills

Table 8. Illustrative coding of push and pull factors into high-tech entrepreneurship

Research question	Illustrative quotes	Coding	Push or pull factor	2nd order coding
What are the push and pull factors that drive individuals to leave employment and engage in entrepreneurship?	*For me, the reason why I would be willing to put risk out in front of an opportunity like this, it would have to be something I'm passionate about. And I'm a terrible sales person, so if I'm talking about something and I want to be able to convince someone else of it, I have to believe in it myself. And if I want to be able to build a team around me of highly skilled, technical people who could get offers from any other company and earn loads of cash, and have all the security, how can I possibly convince them to come work for us and take a hit on salary, and take a total plunge into the dark with a new company, unless I actually believe in it.*	Desire to solve problem	Pull: passion	Self-realisation
	At the time, we were going into a recession, and it probably wasn't the best thing to do but I had some savings, and I did not have any responsibility. I had no dependents.	Economic, Responsibility	Push and pull: personal/ environmental fit	
	The company that [partner] was working for closed so he thought he might as well go with this idea, so we did it. At the time we were running [association] and it got a big spread in the Irish Times, so what I saw was that there was a lot of interest, which I previously thought was a lot smaller in Ireland, and it gave me hope, so we started it.	Economic, Opportunistic		

Table 9. Illustrative coding of knowledge and experience developed in high-tech entrepreneurship and utilised in subsequent employment

Research question	Illustrative quotes	Coding	Knowledge	2nd order coding
What experience do these individuals draw on as they transition back into high-tech employment?	*Being able to sell, to convince customers to come up with some money for our company that was brand new, that really helped [in my subsequent employment in a high-tech firm].*	Customer engagement	Business skills	Tangible skills
	I learnt a lot – about not getting paid, about how to find a customer, how to manage the customers.			

4.2.3. Subsequent employment in the entrepreneurial ecosystem

Three key motivations to move back into employment were reported (Table 10). The need for job (and financial) security was paramount. They referenced financial and relationship difficulties in the business as the primary reason for considering a return to paid employment. Often this was underpinned by changing personal circumstances, for example, starting a family or buying a first home. Second, ten of the participants reported suffering burnout from the intensity of starting and running a business. The third factor reported was desire to (re)start a career in a labour market that offered a greater variety of roles and opportunities.

Table 10. Illustrative coding of push and pull factors into high-tech employment

Research question	Illustrative quotes	Coding	Push or pull factor	2nd order coding
What are the push and pull factors that drive individuals to leave entrepreneurship and return to employment in high-tech industries?	*It exponentially grew my own network. When you spend 12 years in [high-tech firm employment] you tend to have a very closed network, with people in the same industry and sphere as you, whereas when you go into the startup world, half your business is meeting people. It exponentially opened up possibilities*.	Social capital	Pull: resource development	Stable growth
	Everything was proven, we had a great engagement but we did not have any money and it was impossible to raise money.	Financial capital	Push: resource obstacles	
	We talked to a few VCs and they were not interested in a company like ours, although they were helpful. They were really smart and they had good advice. They had no money, but that's not the only thing that counts.			
	I had a young family now, and the pressure was on to bring in revenue, so I had to walk away from [startup] and go work for [high-tech firm]. I was delighted with it to be honest. I got a really nice salary, that I did not think it was possible for someone like me to get, and all these fringe benefits like a PA, pension plan. They even gave me an AMEX card which was really a dream come true – they basically gave me cash flow every month on a card and the credit card company would not have given me money at this stage.	Income	Push: Financial stability	
	For two years of my life I worked at least 10 hours every day including weekends. I burned out really hard and then I called it quits and left. We had released [product] which I considered a massive success. And I just went and worked for [high-tech company] for a couple of years.	Burnout	Push: Mental stability	
	I wasn't willing to do it again, both from a personal and family perspective, and also it takes a lot of energy. There was a period afterwards where I do not think any of the three founders would have gone near a startup for a year or two.			
	At [high-tech company], it was like being your own mini CEO, and you got a lot of flexibility. You get paid to build stuff for other people.	Autonomy	Pull: Employment environment	
	At [high-tech company] I get to build my own book, and I manage my own expenses, so it's like being a company within a company			
	It was pretty easy. I did not really realise that someone was telling me what to do. It felt more like a holiday from having to do loads of things [at the startup] and I never felt like I lost my agency.			
	I do not think I could work anywhere where I did not have a sense of ownership and leadership of what was happening. It's very difficult once you go into the real entrepreneurial world to go into say, a normalised corporate setting. When I joined [high-tech firm] the two reasons I joined would be because I had enough latitude and ownership of where investment was going, the direction we were taking, and also enough stake in the outcomes as well. So not just a salary.			
	If I were to decide to give up this job and start a startup, it's much harder when you have more responsibilities, when you are actually making money.	Income	Pull: stability	

Nonetheless, the return to employment was in most cases gradual. Most entrepreneurs had a period where they had started employment and were still exiting their startup. Together, this highlights that entrepreneurs were seeking to regroup when transitioning back to high-tech multinational employment, following professional and/or personal upheaval. However, most interviewees reported that they had not given up on the agency achieved through entrepreneurship, and appreciated employment that offered not only financial stability, but autonomy.

Evidence of an ongoing entrepreneurial spirit was evident in most individuals who answered, often without any hesitation, that they would return to entrepreneurship if the right opportunity and challenge was identified. Several interviewees mentioned that if they were to start a firm again, it would likely be more successful because they had not only learnt from their previous entrepreneurship experience, but they had, though subsequent employment in a high-tech multinational firm gained a regrouping period of reflection and access to further organisational know how needed to tackle the entrepreneurial challenges that had incessantly arrived and left little time to develop appropriate responses. Nonetheless, some highlighted that despite their learning and improved outlook it would be hard to leave lucrative, stable and fulfilling employment than it had been to leave a more junior position in the past.

5. Discussion and implications

This research emphasises the importance of a largely unexplored and likely quite significant phenomenon of the relatively quotidian flow of human capital and specialised knowledge in dynamic entrepreneurial ecosystems. Each one of our core findings has significant theoretical and policy implications.

First, the evidence on employment history shows that the majority of entrepreneurs were previously employed in the Irish ecosystem. This confirms established evidence on the importance of prior employment in the ecosystem (e.g., Donegan et al., 2019; Spigel and Vinodrai, 2021), which has sometimes been overlooked in favour of other sources of knowledge such as education and technology transfer (e.g., Nicotra et al., 2018). In contrast to Spigel and Vinodrai (2021), our study traced career histories of entrepreneurs rather than anchor firm employees, revealing a greater direct effect of employment mobility on entrepreneurial activity.

This direct effect represents a large number of connections within an ecosystem which theory suggests enhances the ecosystem (Spigel and Harrison, 2018). This contrasts with alternative theory of regional entrepreneurship which seeks to enhance entrepreneurship by attracting talent (e.g., Florida, 2003).

An important policy implication is that rather than creating an *attractive* environment as implied by Florida (2003), the entrepreneurial ecosystems approach implies an environment that aligns with individual motivations to move into entrepreneurship (e.g., Zhao and Seibert, 2006; Di Zhang and Bruning, 2011). For example, those eventual entrepreneurs who, in the early stage of their careers sought convenience (Table 6) by entering employment through internships might rather be encouraged into entrepreneurship through university requirements for placement in an incubator programme rather than traditional work placement.

Second, findings confirmed that most high-tech entrepreneurs who left their high-tech venture returned to employment in organisations in the Irish ecosystem. This is an important contribution to the entrepreneurial ecosystem theory because it suggests that entrepreneurial recycling is not a linear process driven by rare blockbuster exits and terminating with mentorship and investment activity, but rather a continuous process driven by employment mobility. Recognising these flows enables us to theorise about what drives periods of enterprise growth and contraction in ecosystems and contribute new parameters to economic modelling. These rhythms also feed into emerging literature on labour market participation and ageing that recognises that older people are remaining in the workforce longer and shifting between entrepreneurship and employment at later stages of life. Our framework encourages an approach sensitive to the fact that entrepreneurship is not a one-off event or limited to the young and contributes a better understanding of the different types of and motivations for entrepreneurship in later life.

Third, the three most common pathways were all boomerang career paths within a particular type of entrepreneurial ecosystem organisation, suggestive of a continual back and forth flow (Figure 3). This highlights the compatibility of the knowledge valued for both employment and entrepreneurship, supporting the findings of Spigel (2022) that general business knowledge is the important type of knowledge in entrepreneurial ecosystems. This knowledge compatibility provides a theoretical explanation for how entrepreneurial ecosystems can remain resilient and develop in the face of both infrequent anchor firm failure, and more frequent startup failure

and acquisition. While Spigel and Vinodrai (2021) showed that knowledge and experience is retained in an entrepreneurial ecosystem when large employers fail (infrequently), our findings show that high-tech entrepreneurial experience is retained by a return to employment in the ecosystem after (more frequent) entrepreneurial failure or acquisition. For policy, this means it is not enough to just attract anchor firms, nor to create a supportive entrepreneurial environment. Instead, both are needed to ensure the sustainable flow of knowledge needed in the entrepreneurial ecosystem.

Overall, our study contributed to an understanding of knowledge that is valuable for entrepreneurial ecosystems and showed how individual motivations change through the career-path of entrepreneurs. Table 5 shows the changing frequency of motivating factors for the particular employment pathway from multinational high-tech employment, to high-tech entrepreneurship and back to multinational high-tech employment. The evidence of changing motivating factors throughout the boomerang pathway aligns with evidence of changing motivations as entrepreneurs progress through a career pathway of serial entrepreneurship (Wright et al., 1997). We further show how the same factors identified in previous studies that motivate employees to enter entrepreneurship can also motivate entrepreneurs to return to employment. For example, monetary factors (Alstete, 2003; Wilson et al., 2004) and family reasons (Verheul et al., 2006) motivate employees to enter entrepreneurship while our findings show that monetary factors and family reasons also motivate a return to employment. This demonstrates the value of looking beyond entrepreneurship as a one-way street.

The Irish context, characterised by numerous high-tech EMEA headquarters, offers a prominent employment avenue to high-tech entrepreneurs. These firms place value on entrepreneurial experience and attitudes for corporate entrepreneurship (Adenfelt and Lagerström, 2006) which influences which motivating factors are prominent in our findings. For example, in Table 10 we identify autonomy as an important factor for boomerang entrepreneurs re-entering employment and this may not hold in other contexts with limited potential for corporate entrepreneurship. This is epitomised by the illustrative quote in Table 10: 'It's difficult once you go into the real entrepreneurial world to go into say, a *normalised corporate* setting'.

We also expand upon the 'general management knowledge' identified by Spigel (2022) to show that the process goes back and forth between self-realisation (Table 8) and the development of tangible skills derived from new activities (Table 9), followed by a period motivated by regrouping (convenience: Table 7 and stability: Table 10) which allowed individuals the space to develop the tacit knowledge that enabled further self-realisation. From a policy perspective, the implication is that we may need to view entrepreneurial support programmes in a more continuous manner, where support is not measured in terms of once-off events such as incubator graduation, funding success or acquisitions, but are rather where support is measured in terms of ongoing touch points that continue to support entrepreneurs wherever they may be on their path which includes entrepreneurship.

6. Conclusion

Entrepreneurial ecosystems are dynamic systems of complex connections. Our work shows that entrepreneurial career paths are also complex, with numerous feedback loops between entrepreneurship and employment in the ecosystem. We identify a link between the career stage of individuals and their motivations to move into or out of entrepreneurship, as well as the types of knowledge that accompany each stage. We contribute to the entrepreneurial ecosystems literature by exploiting a new source of data to trace entrepreneurial mobility and provide empirical evidence of entrepreneurial recycling not only into entrepreneurship from anchor employers, but from entrepreneurship back into anchor employers. The findings suggest that there is a large direct effect of employment on entrepreneurship in contrast to prior findings of a large indirect effect through subsequent employment in entrepreneurial firms (Spigel, 2022). We show how recycling happens not only in the face of firm failure, but through career progression in a stable environment where entrepreneurship is a step in a career alternating between motivations of regrouping and motivations for expansion. Entrepreneurial recycling can be driven by this ebb and flow throughout the individual career. In doing so we contribute a perspective of entrepreneurial recycling in line with the intent of the entrepreneurial ecosystems approach to place the individual entrepreneur in a central role (Fernandes and Ferreira, 2022), particularly those involved in high growth ventures (Acs et al., 2017; Alvedalen and Boschma, 2017; Brown and Mason, 2017; Stam and Spigel, 2017), rather than an event driven perspective with emphasis on major events such as employer failure (e.g., Spigel, 2022), and startup success and failure (e.g., Bahrami and Evans, 1995).

Finally, we contribute to the literature by demonstrating that the motivations of individual movements into and out of entrepreneurship are accompanied by the development of different types of knowledge that create a self-sustaining loop of entrepreneurial recycling within the ecosystem. This extends our understanding of entrepreneurial recycling to explain how a region can remain resilient in spite of both infrequent large, high-tech firm failure, and frequent high-tech start-up failure.

We conclude by acknowledging the limitations with our study. Our study is based on a directory which may underrepresent tech entrepreneurs of certain groups in Ireland. Further, based on the social media data source, some groups such as retired employees may be underrepresented. Our study only focusses on motivations, knowledge and skills employed in one potential path through entrepreneurship, by high-tech entrepreneurs who were employed in a variety of roles including management, marketing, sales and operations. Further research might focus on the differences between mobility and recycling across these roles and might expand the range of pathways studied, including retirement, consulting and employment in venture capital. A greater number of interviewees with a wider range of employment backgrounds would add additional perspective to this study. An extended longitudinal study may provide greater insights about how long the closed loop of entrepreneurial recycling perpetuates.

Data availability statement

Entrepreneur employment data that support the findings of this study were derived from publicly accessible organisation directories and social media. Interview data is not available publicly.

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Note

[1]Note that while these can also originate from exogenous sources, this paper and that cited focus on dynamics within the ecosystem.

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