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Evidence Review

Productivity and the UK's Deficiency in Scale-ups

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About PIN

The Productivity Insights Network was established in January 2018 and is funded by the Economic and Social Research Council. As a multi-disciplinary network of social science researchers engaged with public, private, and third sector partners, our aim is to change the tone of the productivity debate in theory and practice. It is led by the University of Sheffield, with co-investigators at Cambridge Econometrics, Cardiff University, Durham University, Glasgow Caledonian University, SQW, University of Cambridge, University of Essex, University of Glasgow, University of Leeds and the University of Strathclyde. The support of the funder is acknowledged. The views expressed in this report are those of the authors and do not necessarily represent those of the funders.

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Introduction

Scale-ups - companies which achieve significant growth - play a significant economic role. Indeed, Storey and Greene (2010: 2008) argue that "small businesses that become middle-sized and ultimately large businesses, over a comparatively short period of time, are central to economic prosperity." In particular, they account for a disproportionate proportion of jobs created (Birch, 1979; 1981; 1987; Acs and Mueller, 2008; Henrekson and Johansson, 2010). Anadyke et al (2009) tracked a cohort of new business starts, and found that scale-ups accounted for just 6% of all starts but created over 50% of the jobs over the time-periods studied. This contribution is particularly pronounced in recessions. Equally important, and the concern of this paper is the claim that "scale-up companies enjoy higher productivity rates" (CBI, 2016). Reflecting the political concern about the UK's productivity, Elizabeth Truss, Chief Secretary to The Treasury, stated (in 2017) that "scale-ups are the rising stars of UK productivity."

The UK has high numbers of both small firms and start-ups. However, there is a widespread consensus that it lacks sufficient scale-up companies. Evidence is presented by The Scale Up report on UK Economic Growth by Sherri Couti (2014). The lack of scale-up companies, in turn, is argued to be damaging to overall UK productivity.
The Economist (2016) notes that "increasingly economists worry that it might be one explanation for Britain's low productivity". The Scale-Up Institute notes the growing evidence which shows that scaling businesses generate more productive jobs than the average – approximately £235,000 turnover per employee. This is not just an issue for the UK. The Canadian Advisory Council on Economic Growth (2016) suggests that Canada's lack of start-ups that achieve significant size contributes to its productivity gap with the USA.

Moreover, the geographical distribution of scale-ups is heavily skewed to the south east quadrant of the UK – London, South East England and the East of England. This
drags down the productivity of the rest of the UK which, in turn, has a negative effect on the UK's overall level of productivity,

Definitions

The Couti Report (2014) defined scale-ups as companies with at least 10 employees at the start of the observation period that achieve 20% annual growth in revenue or employment per annum over a three year period. This has been widely adopted as the definition of a scale up. However, this is the same definition previously used by OECD to define high growth firms and which, in turn, is based on Birch's original definition of 'gazelles'.1 The implication is that it is only firms that grow fast are regarded as scale ups. This is inappropriate. The concept of scale-ups needs to be detached from the speed of growth. Many companies achieve scale by growing more slowly. Indeed, it is more appropriate to see the concept of scaling up as crossing a size threshold. One example would be Mid-Market companies. One definition is companies with 50-499 employees (Grant Thornton, 2014). The UK Government's Mid-sized Businesses Growth Review (Gov.UK, 2012) uses a definition based on turnover, £25m-£500m per year.2 Another definition is 'unicorns' – a small, elite group of technology companies have valuations upward of $1 billion in private markets. A criticism of all of these approaches is that the definition of the threshold is arbitrary.

Using the OECD definition, both the number of scale-ups (HGFs) and their significance in the business population are sensitive how they are defined (the numerator) and the definition of the

[1] Another way is to use a high-growth threshold and define Gazelles as the x% fastest growing firms (Henrekson and Johansson, 2010).
[2] Other commentators suggest different lower and upper thresholds – e.g. BDO suggests £10m-£300m (City AM, 23 February, 2015).

business population (denominator). The number of scale-ups is influenced by the following (Delmar et al, 2003; Henreksson and Johansson, 2010):
Choice of growth indicator. Commonly used measures are employment, market share, physical output, profits, and sales. However, firms that are identified as being high growth on one indicator are often not identified as high growth using other indicators.
Measurement of growth. Growth is measured in several ways, both in absolute and relative terms. Multiple or composite growth indicators and growth measures are also employed. Measuring growth in relative terms clearly favours smaller firms.
The time dimension. Firm growth fluctuates substantially over time. The choice of time period over which growth is measured, annual growth, growth between initial and final year etc. all affect observed growth rates.
The process by which firms grow. Is it based on organic growth or is growth through acquisition also included?
Each definition generates a unique population of HGFs.

The choice of definition and measurement approach will identify the number of HGFs in an economy (national, regional) over a specific time period. But to measure their relative importance in that particular economy requires an appropriate definition of the stock of businesses. A broad definition will define a numerically large business population which risks generating the conclusion that there are 'too few' scale-ups in the economy. The number of UK companies has been inflated in recent years on account of the growth of so-called personal service companies created by self-employed contractors for tax advantages (dividends being taxed at a lower level than salaried income) to sell their services.[3] The most appropriate definition of the business stock is therefore 'non-zero employment businesses', alternatively termed 'employee enterprises' (Anadyke-Danes et al, 2009). The proportion of HGFs will be inflated in regions with smaller business populations on account of their low business creation rates.

What Do We Know About High Growth Firms?

Regardless of time-period, method and definitions, and time period and macro-economic conditions, a number of fairly consistent conclusions about the characteristics of scale-ups can be drawn from the literature on high growth firms. As Brown et al (2017) observe, these conclusions often are at variance with the assumptions that underpin policy. First, HGFs tend to be younger on average, although the majority are over five years old. High growth should therefore not be seen as simply being about start-ups. Second, they are of all sizes, although smaller firms are over-represented. However, larger firms make a disproportionate contribution to job creation in absolute terms. Third, high growth firms exist in all industries. They are not over-represented in high-technology industries. Fourth, growth can occur both organically and through acquisition. Young and smaller firms are more likely to grow organically whereas growth through acquisition is largely restricted to larger firms. However, the contribution of high growth firms to employment growth is similar regardless of whether organic or total growth is studied (Henrekson and Johannson, 2010). Fifth, the link between growth and profitability is complex. Davidsson et al (2009) indicate that profitable low-growth firms are more likely to reach high growth and high profitability than firms that start from a position of high growth and low profitability. Two additional points can be made. Few HGFs emerge out of universities. And few HGFs have attracted investment from venture capital funds (Brown et al, 2017)

This heterogeneity in the characteristics of HGFs is illustrated in a study of HGFs in Scotland (Mason et al, 2015). First, in terms of their age profile, only a minority were less than 10 years old, confirming that fast growing firms are not confined to recent starts and that genuine 'gazelles

[3] Client companies also benefit from using such arrangements because it avoids them paying employer National Insurance.

represent a minority of HGFs. Second, the ownership structure is highly varied, comprising family businesses, employee-owned businesses, publicly listed and privately held companies. Third, only a minority conform to the entrepreneurial model of a business that is started from scratch by an entrepreneur, or entrepreneurial team. The majority of firms had been 'pre-incubated' - in the sense of previously being part of other organisations. In all cases rapid growth only occurred after these businesses had become independent. This has taken various forms. The single biggest category were management buyouts (MBOs) and buy-ins (MBIs). Other cases comprised an employee-buyout of the commercial interests of a not-for-profit organization, a free-standing business established in a new industry by long-established family owned company, and three long-established businesses that have been reinvigorated under new management. Two implications arise. First, HGFs are not restricted to de novo start-ups. They are often incubated in one form or another in existing businesses, often for a considerable amount of time, to emerge as fully-formed businesses. Second, there is a need to separate the 'entrepreneur' from the 'business'. In the majority of cases the success of HGFs was attributable not to their founding entrepreneurs but to professional CEOs who had taken control at various points post-start-up.

Not only do very few firms achieve significant growth, for those which do, growth is typically highly discontinuous. Garnsey et al (2006) present evidence to show that growth is non-linear and prone to interruptions and setbacks, sustained growth is rare, early growth can go into decline and that new firms find it hard to sustain rapid growth. Indeed, 'one shot growers' – companies that exhibit an unsustainable burst of growth – were the most significant category in Delmar et al's (2003) study of HGFs in Sweden. The implication is that a firm which meets the definition of high growth in the period t1 to t2 is unlikely to qualify as a high growth firm in the period t2 to t3, but could reappear in the period tn to tn+1. Businesses which sustain fast growth are very rare (Coad and Hölzl, 2009). There is a preponderance of HGFs that are unable to sustain high growth beyond a specific time period. This has also prompted scholars to question the relevance of staged growth models (Levie and Lichtenstein, 2010; Daunfeldt and Halvarsson, 2015). McKelvie and Wiklind (2010) argue that research has focused too much of the 'how much' aspect of growth and that more research is needed on 'how' questions – i.e. the mode of growth. An emerging line of enquiry in this vein conceptualises the notion of key 'growth triggers' as a fundamental determinant of firm growth (Brown and Mawson, 2013). Understanding why (and how) some firms are able to capitalise on these growth opportunities or overcome these 'growth triggers', or 'critical junctures' (Vohora et al, 2004), is central to our understanding of HGFs (Brown and Mawson, 2013).

High Growth Firms and Productivity

There is limited discussion of the link between HGFs and productivity. One of the few papers that addresses this issue is by Du and Temouri (2015). Their review of the literature highlights several drivers of firm productivity, including the adoption of technology, intangible assets, management practices, international sales and access to finance. They suggest that the positive relationship between productivity and HGFs arises because the factors which drive HGFs – such as managerial practices, R&D, product, process and business model innovation, organisational structure, knowledge and learning, and internationalisation – also enhance productivity.

Acs et al (2008) identifies that high-impact firms4 have large effects on productivity in the USA. They also find that differences in labour productivity between high- and low-impact firms has widened in the USA over time. Using UK firm-level data, Mason et al. (2012) find HGFs to be on average more productive, but that they have a limited contribution to overall industry productivity growth. Bravo-Biosca (2010, 2011) uses industry-level data for 12 OECD countries over the period 2002–2005 to test the relationship between total factor productivity (TFP) and growth which is proxied by whether firms expand, contract or remain static over a period of time. The results show that the greater the share of firms that remain static, the lower the productivity growth observed. However, the share of both growing and shrinking firms is associated with faster productivity growth. Europe has a much larger share of static firms, which may be a reason for the regions' lower productivity performance at the aggregate level. Du and Temouri's (2015) own analysis suggests that the association between HGFs and productivity is a two-way relationship. First, firms that exhibit higher productivity growth are more likely to be HGFs. However, age of firm and sector - manufacturing vs services – also have an influence on the relationship. Second, HGF experience enhances the prospects of higher productivity growth. In other words, there is a self-reinforcing process: firms with higher productivity are more likely to grow faster in sales and in turn HGFs are more likely to achieve higher productivity growth. A report by Octopus Group (2018) reports that high growth small businesses are significantly more productive than the average business, creating an additional two months of economic output compared with the average UK business.

Firm Growth

There is a significant volume of studies that sought to identify the factors associated with high growth. However, few studies have been able to establish direct causality (Coad, 2009). A significant strand in the HGF literature relates to the distinctive characteristics of the founder(s). Studies have focused on motivation, gender, education, sector experience, prior management experience, prior start-up experience, unemployment and team vs. solo starts. However, the results have been largely inconclusive. Storey and Greene (2010: 265) conclude from their review of the literature that "perhaps with the exception of education, age, gender and employment status of the founder the link between pre-start-up factors and new/small business performance are difficult to identify. Furthermore, these four factors provide only a modest insight into the performance of the new/small business." Specifically there is little or no evidence that entrepreneurial traits (e.g. need for achievement, sector experience or prior management experience are linked to high growth. High growth entrepreneurs are disproportionately male and in their 30s and 40s (i.e. the effect of age is an inverted-U). As noted earlier, growth is not associated with particular firm characteristics. The evidence on the link between strategic factors (e.g. workforce training, management skills, innovation) is also weak.

[4] They define high impact as enterprises whose sales have at least doubled over a four-year period and which have an employment growth quantifier (the relationship between its absolute and percentage change) of two or more over the period. The average age of high-impact firms is 25 years old.

Reviewing this evidence, Storey and Greene (2010: 306) conclude that the success of quantitative studies in explaining business growth "is extremely modest." Coad (2007) suggests that the variation explained in many studies generally does not exceed 10%, leaving 90% or more unexplained. The heterogeneous nature and vagaries of firm growth is increasingly encouraging the view that there is a significant random component in growth (Coad et al., 2014). Others would suggest that growth is linked to serendipity (Martello, 2006) or 'smart luck' (Davidsson, 2004) - being in the right place at the right time to discover or recognise high potential entrepreneurial opportunities. Table 1, from Storey and Greene (2010), summarises the evidence.

Table 1. Factors associated with firm growth

	Positive impact	Negative impact	Unclear impact
Pre-start-up factors	Prime age Higher education Males Personality (indirect effects)	Unemployment	Team entrepreneurship Prior management experience Prior sectoral experience
At start-up factors	Limited company Location		In business before Family Initial size Sector
Post-start-up factors			Formal business plan Entrepreneurial skills Strategy External environment Equity financing Innovation

Source: Storey and Greene (2010) Table 15.2

The consequence of this methodological bias towards quantitative studies is that "key characteristics of HGFs remain unknown" (Coad et al, 2014, p. 106). This has led to calls for more in-depth qualitative analysis in the field of high growth entrepreneurship.

Dodds and Hamilton (2007) offer some more definitive conclusions from their study of HGFs in New Zealand. They identify four key founder-related variables associated with high growth: (i) start-up motivation, with the desire to exploit a market opportunity much more important than push-related motives; (ii) amount of education and subject along with soft skills such as search, foresight, imagination and communication; (iii) experience—the role of prior entrepreneurial experience is a distinct advantage; and (iv) size of the management team—with larger teams linked to high growth on account of their greater resources and expertise. In terms of business practices, their motivation was to create unique value for their customers based on their detailed customer knowledge (Barringer et al., 2005). They are also open to and willing to actively search for relevant advice on an ongoing basis. Somewhat paradoxically, however, HGFs make limited use of public sector advice and support (Smallbone et al., 2002), often preferring peer based advice and support instead (Fischer and Reuber, 2003).

There is some empirical support from quantitative studies for a positive relationship between firm-level innovation and high growth (Coad, 2009; Mason et al., 2012), although the link

remains uncertain. However, Hinton and Hamilton (2013) offer a more nuanced view of the link between innovation and growth. They report that while all of their HGFs viewed their product, service or value proposition as innovative, in all cases, the innovation stopped short of true novelty and was, instead, an alternative marketing or distribution strategy or an amendment to an existing service value proposition (and hence did not require significant R&D expenditure). In other words, the focus of HGFs is more likely to be on what some have termed 'mid-level innovation' (Bhidé, 2008) and others "minnovation – that unexpected twist on an existing idea" (Isenberg, 2013, 11).

It is also argued that HGFs follow a distinctive business strategy, seeking market niches with little in the way of effective competition (Hinton and Hamilton, 2013). This is achieved in three ways: first, by favouring business rather than consumer markets; second by developing close relationships with a small number of large customers; and third, by emphasising customer service as a key basis of differentiation in the market which, in turn, requires a significant emphasis on staff training. There is evidence that HGFs use innovation to compete on the basis of differentiation, enabling them to be price setters rather than price takers. Collaboration strategies such as joint ventures, consortia and alliances also appear to be critical for such firms, enabling them to access a broader base of resources (Mohr and Garnsey, 2014) consistent with the 'open innovation' model (Chesborough, 2003). Exporting and early internationalisation are also characteristics of HGFs, particularly for those located in small countries, in order to broaden the customer base and increase sales volume.

Mason et al's (2015) study of HGFs in Scotland found that the vast majority were engaged in selling to other businesses (B2B). Few firms were engaged in manufacturing. Moreover, the vast majority of the manufacturing firms had a significant service component as part of their offering, underlining the pivotal position that service activities now assume in the production process. As Bryson et al (2002, p. 978) have noted, the "profitability [of manufacturing firms] increasingly depends not just on the manufacturing part of the production process, but on the knowledge aspects and service functions within which the products are embedded." Few firms were in technology sectors. That said, several companies could be classified as knowledge-based, having developed innovative products and services. Several had developed innovative business models. Overall, around two-thirds of the sample could be described as being innovative – opening new markets, bringing new products and services to market, or developing new business models. In other words, it was this innovative end-user-orientation, rather than technological innovation per se, which was the key driver for propelling firms towards rapid growth. This strong B2B orientation and use of business models that target 'solutions' has meant that many of the firms derive their sales from ongoing relationships with existing customers rather than from one-off transactional relationships. Close relationships with customers gives firms a deep knowledge of their markets (Von Hippel, 2009), providing them with an understanding of their customers' needs and wants, and the ability to anticipate their future need.

The Geography of HGFs

The existing literature allows three observations to be made about locational determinants and dynamics of HGFs. First, HGFs exhibit a distinctive geography, being disproportionately concentrated in specific regions and localities. In the UK various studies have reported that gazelles are much more prevalent in London and the South East than in other regions (Mason, 1985; Gallagher and Miller, 1993, BERR, 2008).5 Amini et al (2012) have highlighted the geographical concentration of AIM listed companies in London. In the USA 40% of gazelles located in just 20 cities. These 'gazelle regions' are primarily large cities on the west coast (for example, Los Angeles, Seattle, San Francisco, San Diego), around Chicago and on the east coast (for example, New York, Boston, Washington DC, Miami, Tampa). The employment effect of new firm formation is greatest in these cities. An analysis of the annual INC 500 listing of fastest growing private companies in the USA from 1982 to 2010 (Motoyama and Danley, 2012) found that in the 2000s, at the state level, California and Texas had the most HGFs and were also the top states when normalised by population, followed by Virginia, New York and Florida. Moreover, this geographical distribution of HGFs has become more unequal over time. However, neither the availability of venture capital, high tech, university R&D nor patents per capita were statistically associated with the geography of HGFs.

The second point is that HGFs can be found in all types of location—core regions and peripheral regions, and large city and rural area. In the case of the UK, Vaessen and Keeble (1995) have noted that fast growth firms are located in both peripheral and core regions, indicating that 'firms have been able to grow in environments which lack the range and scale of facilities and agglomeration advantages of the South East' (502). They conclude that firms are able to achieve fast growth in peripheral regions by developing place-specific strategies to overcome the constraints of such locations. This is reflected in differences between fast growth firms in peripheral regions and the South East in terms of the nature of competition, innovation activity and technological intensity and skill structures.

Third, following on from the previous point, there is evidence of qualitative differences in the nature of HGFs in different regions. Gallagher and Miller (1993) reported that gazelles in the South East had a much higher turnover and created twice as many jobs on average as those in Scotland (348 cf. 160) and accounted for a much bigger share of job creation. They also note sectoral differences, with manufacturing firms over-represented in Scotland and financial services firms under-represented compared with South East England. In The Netherlands, Stam (2005) found that the gazelles in knowledge- intensive business services have a different geography to gazelles in high-technology manufacturing: the former are disproportionately concentrated in highly urbanised regions, whereas the latter the latter are concentrated in rural areas.

[5] See Batchler (2017) for an analysis showing Scotland's deficit in HGFs based on an analysis of 'high growth firm lists'.

Barriers to Scaling-up

Several barriers to scale-up have been identified, including access to markets, lack of entrepreneurial experience and access to finance. Two themes have dominated: access to finance and access to management talent.

Finance

There is a strong view that the UK lacks sources of long-term finance for growing innovative firms looking to scale up. This had led to the Government establishing The Patient Capital Review (announced in November 2016), led by HM Treasury, to identify barriers to access to long-term finance for growing firms. It identified that a major challenge for growing businesses aiming to reach scale is a lack of available "patient capital". This has created latent and unsatisfied demand for financing from the best high growth businesses and limited the size of investments in scale-ups already receiving funding. This lack of capital availability forms one part of a negative feedback loop, together with historically low returns for venture investments, and low attractiveness of the UK market to top talent. This loop has historically suppressed scale-up opportunities.

These issues is addressed by Arundale (2018). He notes that US venture capital funds have a superior financial performance than UK and European VC funds. The consequence is that venture capital is a more attractive asset class for institutional investors in the US, meaning that the availability of venture capital is much greater (albeit characterised by a high level of geographical concentration). One of the most significant outcomes is that US VCFs are much larger than their counterparts in the UK and the rest of Europe (average sizes of $282m, $168m and $128m respectively). This has several negative consequences for UK VCs. First, they have less capability to make multiple follow-on rounds of investment in investee companies and will seek to exit at an earlier point in the scaling up of their investee companies. Second, UK VCs have to spend more time on fund raising and hence less time on supporting their investee companies than their US companies. Third, because UK VCs lack the size of funds to support their investee businesses, entrepreneurs have to continually engage in raising finance. Moreover, US VCs are more likely to have had operational and entrepreneurial experience than their UK counterparts, who are more likely to have backgrounds in finance, and can therefore support their investee companies more effectively. Bottazzi et al (2004) report that VCs with greater operational and entrepreneurial experience provide more support and governance to their investee companies than those who do not. Arundale also notes that there are various operational differences between US and UK VCFs. One of the most significant is that US VC firms are more willing to make small investments in early stage investments to 'test the waters'. In line with options theory, this gives them an opportunity to make larger follow-on investments should the business seem promising and reduces their risk of missing out on a potential successful investee business. UK VCs, in contrast, have a more rigid approach to their investment strategy with clear size of investment and stage of business criteria.

Venture capital investments are geographically highly concentrated. BVCA data shows that London and the South East attract a disproportionate share of UK venture capital investments, accounting for 46% of all VC investments in 2016 and 44% in 2015. This share is even higher in terms of the amount invested – 65% and 77% respectively. London alone attracted 29% of investments in 2016 and 41% of the amount invested (29% and 64% in 2015). The rest of the UK attract less than their 'fair share' of VC investments relative to their share of UK economic activity. Given the association between HGFs and venture capital investment (e.g. Mohr and Garnsey, 2011) this would seem to be one reason why such regions also have relatively few scale up companies. Moreover, a significant and increasing proportion of venture capital investments in the UK regions involve public sector venture capital funds either investing on their own or co-investing alongside private investors (Mason and Pierakkis, 2013). There is a

debate in the literature on whether government venture capital funds are as effective investors as private venture capital funds on account of being less effective in supporting their investee companies. However, it can also be attributed to the wider economic and social investment objectives of such finds and the lack of investable businesses in such regions (the 'thin markets' issue – Nightingale et al, 2009).

Management

The romantic notion of the lone entrepreneurial hero represents one of the most enduring images associated with the concept of entrepreneurship (Cooney, 2005; Anderson et al., 2007). However, empirical evidence suggests that it is more common for the management of entrepreneurial ventures to be performed by teams (Cooper and Daily, 1997; Harrison et al, 2004). This is particularly true of ventures operating in high-technology sectors (Oakey, 1995). The fundamental rationale behind team-managed firms is that superior managerial performance is encouraged through the combination of diverse skillsets and experience levels (Kamm et al., 1990; Cooper et al., 1994).

Portrayals of how top management teams (TMTs) develop depict a model of staged professionalization where simplified embryonic management structures give way to increased formality and more diverse human capital resources in line with stages of firm growth (Beckman and Burton, 2008).6 In these conceptions of TMT development the starting point from which the subsequent progression of the team is examined is often depicted as being a lone entrepreneur. For instance, Beckman and Burton (2008) underline the popularity of the independent 'garage entrepreneur' or single technician as an assumed point of origin for technology-based TMTs. But in practice, multi-founder start-ups are the norm. Indeed, a balance of heterogeneous skillsets acts to enhance organisational performance. This is particularly important in technology based firms where the need for nascent technology entrepreneurs to augment their deficient commercial experience with 'commercial' or 'managerial' human capital is seen as crucial. However, the ability of emerging businesses to recruit senior management people with the relevant commercial experience is seen as a further barrier to scaling-up.

Given the deeply embedded spatial division of labour (Massey, 1994) in the UK involving the concentration of high level corporate functions in London and South East England, and the impact that this has on inter-regional migration flows, entrepreneurial firms in peripheral regions of the UK have particular difficulties in recruiting to senior management positions. A study of the development and recruitment of top management teams in technology businesses in Scotland (Matthews and Mason, 2013; Matthews, 2018) highlights these issues. The problem that Scotland has is that in technology sectors academic institutions, rather than commercial environments, are the dominant sources of human capital incubation. Indeed, Scotland performs more than its 'fair share' of public sector R&D (mainly in universities) but is under-represented in terms of private sector R&D. The consequence is a relative scarcity of human capital with both technology and commercial experience to start or join new and emerging technology businesses. Moreover, the lack of technology scale-ups – in part a function of the acquisition of promising technology companies at an early stage - limits the pool of people with senior management experience in scale-up companies that ambitious companies can recruit into similar posts or as board members.

The study was based on an in-depth analysis of 18 technology based firms that were between three and eight years old. The majority of TMTs were small and displayed a lack of significant cumulative growth in terms of member numbers. Indeed, many of the TMTs did not increase membership to a degree that saw management level appointments in all, or at least most, of the expected traditional management functions of a high tech firm (CEO, Technical/Research, Sales,

[6] As noted earlier, the stage model of business growth does not stand up to empirical scrutiny (Levie and Lichtenstein, 2010).

Marketing, Operations, Finance). Some firms made no changes in their TMTs, meaning that they did not accumulate human capital through recruitment of external personnel. Indeed, the firms were dominated by founder-managers. Others simply replaced management personnel who left but did not add to their TMT. In short, in contrast to the literature that emphasises TMT growth as a process of professionalization in which founders are replaced by more broadly experienced executives (Bruton et al., 2000; White et al., 2007; Pollock et al., 2009), the sample examined here highlights instead that members of the founding team are more likely to remain central to the TMT throughout the development lifespan. Strategies for human capital accumulation was dominated by the recruitment to non-executive board positions.

The stability in TMTs arises for three reasons. First, although most firms recognised the importance of adding to their functional experience they experienced constraints in doing so. The key constraint was the cost of adding new TMT members. This, in turn is linked to lack of access of firms in peripheral regions such as Scotland to venture capital. Most firms were cash constrained and preferred to use their available finance to invest in technology development. Second, was their lack of growth. In the absence significant scale up of operations there was simply less need to increase in organisational complexity and thus less need to reshape the management. Those firms with conservative growth orientations were also likely to have small TMTs and be founder-managed. Indeed, although the vast majority of TMTs began with positive growth aims based around the securing of external finance and the servicing of international markets, initial growth orientations became markedly less ambitious if they experienced difficulties in achieving milestones set by investors. This was chiefly due to the effect that perceived poor performance had on the flow of finance. If targets were missed then investment tranches became more difficult to secure, and strategic objectives would have to be modified accordingly. When this happened the need to expand the TMT became not only less necessary, but it also became more difficult considering the decreasing availability of financial support. Third, even successfully performing investor-backed ventures experienced constraints that had an impact on the growth of their TMT. These constraints largely stemmed from the exit intentions of their investors. The vast majority of ventures cited trade sale as a likely exit. In fact, only two firms consistently expressed aims to grow into a “company of scale”. These exit intentions impacted on TMT development because it was recognised that a particularly large and complex system of management could be unattractive to potential buyers. This encouraged many TMTs to remain as ‘lean’ as possible.

The influence of prior work experience of the TMT is therefore critical. The best performing firms possessed core leaders (usually founders) with commercial experience in a related technical environment; or had secured the early services of a mentor with significant commercial experience in a related technical environment; or had a combination of both. The TMTs in these firms displayed a predominately planned-progressive strategic orientation. By contrast, the majority of poorly developing TMTs had limited growth ambitions and commercially inexperienced technologists in leadership roles. Looking more closely at the nature of the prior experience held by core leaders within strongly developing TMTs, it was clear that the emphasis here was on incubation in environments that offered exposure to a range of venture growth stages. Experienced leaders within strongly developing TMTs were unlikely to have had a background solely as an executive in a large multinational firm. If such experienced was in evidence, it was likely to be combined with prior experience in a leadership role within an entrepreneurial venture. Alternatively, there is emphasis placed on the value of experience in product line development roles within more established firms. Again, the focus here appeared to be on familiarity with multiple stages and multiple functions as opposed to expertise in a set management area within a stable environment. This supports the evidence from the literature that experienced entrepreneurs are more prone to pursuing high value exit targets such as international mergers, acquisitions, or IPOs (DeTienne and Cardon, 2010).

In summary, this study demonstrates how the regional context shapes the resources available for entrepreneurial companies to grow. The nature of employment constrains and truncates the nature of employee work experience. In addition, the lack of scale-up companies creates a vicious circle by limiting the number of entrepreneurs and senior managers with experience of growing a firm from start-up to a significant size. Both factors prevent the creation of experienced labour sources within peripheral regions such as Scotland. This, in turn, is a constraint on the emergence of scale-ups. This is reinforced by other features of the regional economy, notably access to venture capital.

Exits

A further explanation for the lack of scale-ups in the UK is that many entrepreneurial firms with the potential to scale-up get acquired at an early stage by larger businesses, either because they have raised venture capital and their investors now seek an exit, or because they are unable to access finance to grow, or both. Whereas large acquisitions – such as Skyscanner or ARM – attract the headlines, the vast majority of acquisitions of entrepreneurial companies are small (less than £30m). This creates a source of bias in the statistics on firm growth by removing potential and actual scale-ups.

Of course, exits may simply impact on the statistics on scale-ups rather than on the real economy. However, this depends on what happens to such firms following their acquisition. If acquired firms maintain their growth as part of a larger corporate organisation then they continue to contribute to the economy but drop out of the statistical base. However, there is a lack of studies on the post-acquisition experience of firms. Acquisition might be expected to result in the growth of the acquired company. First, the motive of companies being acquired is typically to overcome a range of barriers that are preventing them from reaching their aspirations - in other words, they are often approaching or have reached a 'glass ceiling' (Davenport, 2009; Hopkins, 2014). A second reason why acquisition by larger firms might be expected to promote their growth is on account of the ownership advantages of such firms, notably management skills, international networks and linkage to knowledge.

A Swedish study using micro level longitudinal data finds that the existence of positive impacts on growth depends on the nationality of the acquiring firm. Acquisition by Swedish MNEs significantly improves the employment growth of the acquired firm, but not its sales. Acquisitions by foreign MNEs and Swedish domestic companies were not found to have any significant effects on either employment or sales growth (Xioa, 2015).
A UK study of the effect on SME takeover on regional productivity finds that the more productive SMEs are more likely to be taken-over, although the effect is weaker in peripheral regions than in core regions (Foreman-Peck and Nicholls, 2013). Takeovers also increased the chances of SMEs closing. But this is more likely in core regions than in peripheral regions. In Foreman-Peck et al's study, takeovers raised productivity after acquisition but less than for the most productive SMEs.

A key factor that determines the impact on regional development is whether a post-exit company (i) stays in the region; (ii) moves to another region or (iii) moves abroad. If the company in question is strongly linked to other local businesses, a move could potentially be experienced even more negatively (Stam, 2007). A move may, of course, be rational from the point of view of the company (skills supply, market proximity, knowledge integration with the acquiring company, etc.) (Maksimovic et al., 2011). One of the few studies that has addressed this issue is by (Carpentier and Suret, 2014). They examined the exit of venture capital-backed new technology firms in Canada. They find that most are sold to foreign – mainly US companies – with the acquisition motivated by strategic considerations. This has two adverse consequences for economic development. First, the majority of the NTBFs that are acquired by foreign firms

are either migrated to the US by their new owner or are simply absorbed into the acquiring company. In either case they disappear from the Canadian economy. In the other cases the acquirer only maintains a small part of the bought-out firm's activities in Canada, leaving only the R&D function and eliminating head office, sales and finance and production functions. This leaves a truncated or 'hollowed out' business. They conclude that foreign trade sales have systematic negative effects on local economic development. And as these are driven by venture capital funds seeking exits they further conclude that the venture capital industry in Canada, including Government Sponsored Funds, is a significant source of migration of promising new technology based firms to the USA.

However, it is not clear the extent to which these conclusions are generalisable. The Canadian and US economies are closely integrated. Contrasting evidence from Sweden, albeit now quite dated, found that foreign acquisitions had positive effects, probably because the acquiring company let the acquired SMEs retain their autonomy (Dahlstrand, 2000). A detailed study of acquisitions of Scottish companies (Hopkins, 2014) found that it does lead to additional benefits being created within Scotland, both for the firm and the wider economy. It highlighted that inward acquisitions of Scottish companies can and do bring additional benefits to companies and the wider economy through growth in jobs, turnover, growth in the supply chain, investment in plants and machinery as well as staff. All of these benefits were above what the company would have been able to provide had it remained independent and may not have been able to provide through organic growth, certainly not at the same pace. One of the reasons the inward acquisitions in this study have proved to be more beneficial, not just for the company but the economy, is because the acquired Scottish companies have been embedded within Scotland. This is because in many cases the motivations of the buyer was to access the network of skills, public agency support, available expertise, and infrastructure, access to the Scottish and UK markets. These features lent themselves to an outcome which retained the company in Scotland post-sale. However, these benefits have to be balanced against the evidence that only around one in two Scottish companies that are acquired remain active post-acquisition.

Any assessment of the economic impact of the acquisition of entrepreneurial companies also has to take into account how much entrepreneurial recycling (Mason and Harrison, 2006) occurs. Entrepreneurial exits – by definition – involve the departure of the entrepreneur(s) from the business. This may happen at the time at which he ownership of the firm changes, or soon after. Some members of the management may also leave. Outside investors will also sever their connection with the company once their shares are bought by the new owner. This enables the financial wealth and learning which has been created by the growth of an entrepreneurial business to be released and re-invested. This process was captured by Mason and Harrison (2006) in an in-depth study of the trade sale of five Scottish technology companies. The focus was on what the entrepreneurs did after selling their companies. The case studies revealed that each of the entrepreneurs recycled both a proportion of the wealth that they had generated from the sale and also the learning and knowledge that they had acquired in a variety of new entrepreneurial recycling processes, including starting new businesses, becoming business angels and establishing entrepreneurial institutions that enriched the entrepreneurial ecosystem, including venture capital funds and entrepreneurial support organisations. Moreover, most of the businesses had two or more entrepreneurs and they each tended to separately undertake their entrepreneurial recycling activities which magnified the economic impact. However, the study by Carpentier and Suret (2014) discussed earlier found limited evidence of entrepreneurial recycling. Those entrepreneurs who go on to start new businesses – serial entrepreneurs – are more likely to create scale-up companies on account of their financial wealth which gives them some degree of personal financial security and the ability to self-fund the launch of the new business, credibility with investors and other stakeholders and learning from the experience of growing a business from start-up to exit. The impact of these entrepreneurial recycling processes is a function of the size of the exit, itself a function of the extent to which the company has scaled. However, as noted above, most entrepreneurial companies that are acquired are

quite small, which restricts the amount of wealth creation and learning that are available for recycling.

Summary

There is a consensus that scale-ups have a positive impact on productivity. The UK is thought to have a deficiency in scale-ups which, in turn, is argued to damage its overall productivity. The discussion of scale-ups has been based on one particular, and arguably inappropriate, definition. However, the definitional issue remains unresolved and requires further consideration. There is also a need for more research on companies that have crossed significant size thresholds, however these are defined, such as emergent mid-market companies. There are few, if any, distinguishing characteristics of scale-ups – they occur in all sectors and are not confined to any particular age of firm. Causal factors in firm growth remain unclear. Research therefore needs to re-focus away from the concern with 'how many' scale-ups and to consider 'how' questions regarding the nature of growth processes and their drivers. Scale-ups do exhibit a distinctive geography, being over-represented in London and South East England. This is a contributory factor to geographical variations in UK productivity. Barriers to scaling up have focused on access to finance, particularly venture capital, and management expertise, especially prior experience in companies that have achieved scale. Access to both finance and experienced managers also exhibit geographical variations, being much more plentiful in London and the South East than in peripheral regions. Research on scale-ups therefore needs to take a geographical perspective, looking at both barriers to the emergence of scale-ups in 'the north' but also successful scale-ups in these regions to understand how they have achieved growth. There is also a need to investigate the connections between entrepreneurial ecosystems and HGFs (e.g. Motoyama et al, 2013; Desai and Motoyama, 2015). Many companies that have scaled-up or have the potential to do so are acquired by larger businesses, sometimes as a means of accessing finance and other resources to further expand. But because such firms are no longer independent entities they drop out of the statistical base. This raises the possibility that the lack of scale-ups in the UK is at least in part a statistical artefact. There is limited evidence on the post-acquisition performance of such firms. Do they continue to grow under their new ownership? The evidence is limited and inconsistent. However, several studies suggest that acquisition has a negative impact and hence adverse implications for productivity.

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