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Economic Development**

Margarida Madaleno
Max Nathan
Henry Overman
Sevrin Waights

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Margarida Madaleno

London School of Economics

Max Nathan

University of Birmingham, CEP and IZA

Henry Overman

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Sevrin Waights

DIW Berlin and CEP

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ABSTRACT

Incubators, Accelerators and Regional Economic Development*

A growing wave of co-location programmes promises to boost growth for entrepreneurs and young firms. Despite great public and policy interest we have little idea whether such programmes are effective. This paper categorises accelerators and incubators within a larger family of co-location interventions. We then develop a single framework to theorise workspace-level impacts. We summarise available evaluation evidence and sketch implications for regional economic policy. We find clear evidence programmes are effective overall. But we know little about how effects operate – or who benefits. Providers and policymakers should experiment further to establish optimal designs.

JEL Classification: L26, O32, R30, R58

Keywords: entrepreneurship, incubators, accelerators, clusters, cities, economic development

Corresponding author:

Max Nathan
Birmingham Business School
University of Birmingham
University House
Birmingham, B15 2TT
United Kingdom
E-mail: m.nathan@bham.ac.uk

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1) Introduction

Innovation is a driver of development: ideas advance the technological frontier, feeding through to productivity growth (Romer, 1986). Similarly, entrepreneurs are ‘carriers of new ideas’ (Schumpeter, 1962; Audretsch, 2007), who play an important role as part of larger sectoral, regional and national institutions and systems (Freeman, 1991; Cooke, 2002; Malerba, 2002). However, both innovation and entrepreneurship require learning from others, involve experimentation and carry a high risk of failure (Kerr et al., 2014).

Theory suggests geographical concentration is one way to facilitate creativity, the exchange of ideas or reduce entrepreneurial risk. Consistent with this, a large empirical literature documents the positive effects of geographic concentration – at neighbourhood, city and regional scale – on innovation and entrepreneurship.

Most attention has focused on clustering and cluster policies as ways to understand and exploit geographic concentration. Clustering is ‘associated with pervasive market failures’ (Duranton, 2011) (p.4) so government intervention can, in principle, improve on market outcomes. However, in practice the case for, and effectiveness of, cluster policies has been strongly contested (Martin and Sunley, 2003; Duranton, 2011). Duranton (2011) highlights three major difficulties. First, clustering is an outcome of many decisions, as well as a driver, so is not easily manipulated by policy. Second, the complexity of cluster market failures makes policy hard to target effectively. Relatedly, complexity tends to lead to policy tradeoffs – a specific example of the issues now raised around inclusive growth.¹

In this paper we suggest existing debates have focussed too much on clustering as a feature of regional economies and a target for policy, and too little on specific co-location policies. That is, on the effect of policies that enable firms to locate on the same premises (e.g. in co-working spaces) or on sites within walkable distance (e.g. in science parks). This paper plugs this gap by pulling together diverse theoretical strands on co-location and by reviewing the empirical evidence on the effects of specific interventions. We also argue that co-location policy tools can potentially contribute to cluster-level outcomes, and thus to broader regional economic development.

¹ See Lee (2018) for further discussion.

In practice, governments and the private sector use various co-location tools to promote innovation or entrepreneurship, but these are, surprisingly, poorly understood. Two developments make this a timely moment to focus on their impact.

First, a recent wave of studies uses causal inference to understand how co-location of scientific researchers shapes innovation outcomes (Catalini, 2017; Helmers, 2017). Previously, little was known about the effectiveness of science parks and traditional business incubators despite these being well-established interventions (Phan et al., 2005; Siegel et al., 2003).

Second, new variants on business incubation have emerged for start-ups and early stage businesses (Schmidt and Brinks, 2017). With roots in the technology industry, modern incubators and accelerators are found in many large cities. They are marketed as business support programmes, based on co-working, that help start-ups and early stage firms to grow. Incubators typically act as ‘clubs’ – co-working space with mentoring and networking services added on, and firms renting rooms or desks on flexible contracts. Accelerators are more akin to ‘bootcamps’ – intensive networking and mentoring opportunities offered to competitively selected firms, often over shorter time periods.

The UK has the largest number of such spaces outside the US (Telefonica and O2, 2014). These business models are spreading into other sectors such as retail, travel, hospitality, advertising, fashion and visual arts, as well as in high-tech manufacturing via makerspaces and fablabs (Fassio and Grilli, 2016).²

Accelerators potentially generate substantial gains for tenants and – by speeding up entrepreneurship and innovation processes – they may also benefit the wider economy. Proponents claim they help young firms innovate, strengthen business models, then attract external investment and increase sales. For example, Birdsall et al (2013) argue that firms graduating from the best US accelerators have 10-15% higher survival rates after five years, and have earlier and higher rates of acquisition than comparable companies. If such results

² Most recently, corporate-led programmes have emerged that link a single large firm to a cohort of startup/SME participants. These apply some accelerator concepts to existing models of open innovation in large firms and MNEs (McCann and Iammarino 2013) although typically with less emphasis on co-location.

generalise, this suggests a role for economic policy to intervene – to encourage, incentivise, provide, or even regulate.

Around half the UK’s co-working interventions already have public funding behind them – but hardly any test impacts (Bone et al., 2017). There is a clear need to think through, and test, if and how programme effects might operate. Doing this requires addressing several key questions.

First, the selectivity of many interventions means that chosen start-ups might have ‘done well’ without the programme. If selection or signalling drive programme outcomes, the real effect could be minimal. In this case, it makes more sense to see programmes as ways for real estate actors to better utilise commercial space (especially in high-demand cities). In policy terms, they become a planning and property market issue, rather than an economic development one. Second, and relatedly, we need to consider how different types of provision might affect outcomes. The role of universities in many programmes may hold lessons for HEIs as anchor institutions (Valero and Van Reenen, 2016). Third, we need to consider who benefits. Incubators and accelerators may be useful tools in inclusive growth strategies, as a response to rising rents and costs, and as a way of helping (for example) female and minority ethnic entrepreneurs around structural barriers they may face in ‘regular’ economic space (Lyons and Zhang, 2017). Conversely, such groups may find it harder to access such programmes given male-domination in the tech sector. Finally, understanding any programme-level impacts may feed into area-level economic outcomes.

It is thus crucial to develop frameworks for delineating the new wave of colocation tools; assessing possible effects and impact channels, including distributional impacts; identifying lessons, and knowledge and policy gaps that need filling.

This paper is a first contribution to these challenges. It draws on three OECD-wide systematic reviews covering co-location interventions for firms (incubators, accelerators) and for researchers (co-location in a building, conference, science park or major science facilities). We also draw on interviews with policymakers and programme operators. Where appropriate, we relate this material to theory and broader empirical evidence from urban economics, economic geography, innovation, management and economic sociology fields.

The paper makes three contributions. First, we site incubators and accelerators in a larger family of ‘co-location’ interventions. Second, we develop a framework linking workspace-level impacts to several different literatures. Third, we combine the evaluation evidence, such as it exists, and sketch out implications for local development. As far as we are aware, it is the first study of its kind on these new programmes.

2) Methodology

We draw on three linked systematic reviews of evaluation evidence, a survey of the wider literature, and a series of provider interviews.

Systematic reviews are a method for structured literature reviews, using iterated search parameters, multiple searches, and transparent rules for selecting and ranking evidence (Gough et al., 2013). Our three reviews focus on quantitative evaluations of incubators; accelerators; and researcher co-location tools from the OECD, in English. The reviews include any study providing before-and-after or cross-sectional evidence, controlling for differences between supported and unsupported areas or firms. They also include more robust studies using a control group or experimental or quasi-experimental methods (What Works Centre for Local Economic Growth, 2016). Using these criteria, the reviews find fourteen studies looking at effects of accelerators and incubators. Three of these do not distinguish between accelerators and incubators. Eight further studies evaluate researcher co-location tools. These policies include supporting science parks, provision of key scientific infrastructure, building-level co-location, and ‘temporary co-location’ (such as attending events).³

We organise findings by outcome, and vote counts, and evidence quality, then interpret results. In the tradition of ‘realist synthesis’ (Pawson, 2006), we also use material from a survey of relevant qualitative and descriptive studies to help interpret our findings.

³ We focus on evaluations of policies that encourage co-location. This is distinct from a larger set of studies that describe researcher location patterns or compare outcomes between more and less densely concentrated groups. The studies we focus on provide stronger evidence of causal impact of specific ‘interventions’, arguably more relevant for policymakers in designing specific interventions.

Finally, we conducted semi-structured interviews [n = 8] with incubator and accelerator providers, as well as industry and academic experts, using snowball sampling.

3) Definitions, business models and the wider context

We view accelerators and incubators as business support programmes providing packages of support to young co-located firms. We distinguish accelerators from incubators based on the definition in Hathaway (2016), summarised in Table 1.

Accelerators use competitive entry and intensive support, typically targeting start-ups for 3-6 months. Accelerators may be non-profit, although they are more often operated by venture capitalists who take equity stakes in participating companies. Participants are usually provided with an on-site work place, plus business skills training, intensive mentoring and networking activity. The application process is typically highly competitive. For instance, YCombinator, a top US accelerator, has two application seasons per year, accepting just two or three per cent of the several thousand firms applying.

Table 1. Key terms.

	Accelerators	Incubators
<i>Duration</i>	3 to 6 months	1 to 5 years
<i>Cohorts</i>	Yes	No
<i>Business model</i>	Investment; can also be non profit	Rent; non profit
<i>Selection</i>	Competitive; cyclical	Non-competitive
<i>Venture stage</i>	Early	Early or late
<i>Education</i>	Seminars	Ad hoc; human resources or legal support
<i>Mentorship</i>	Intense; by self and others	Minimal; tactical
<i>Venture location</i>	On-site	On-site

Source: Adapted from Hathaway (2016).

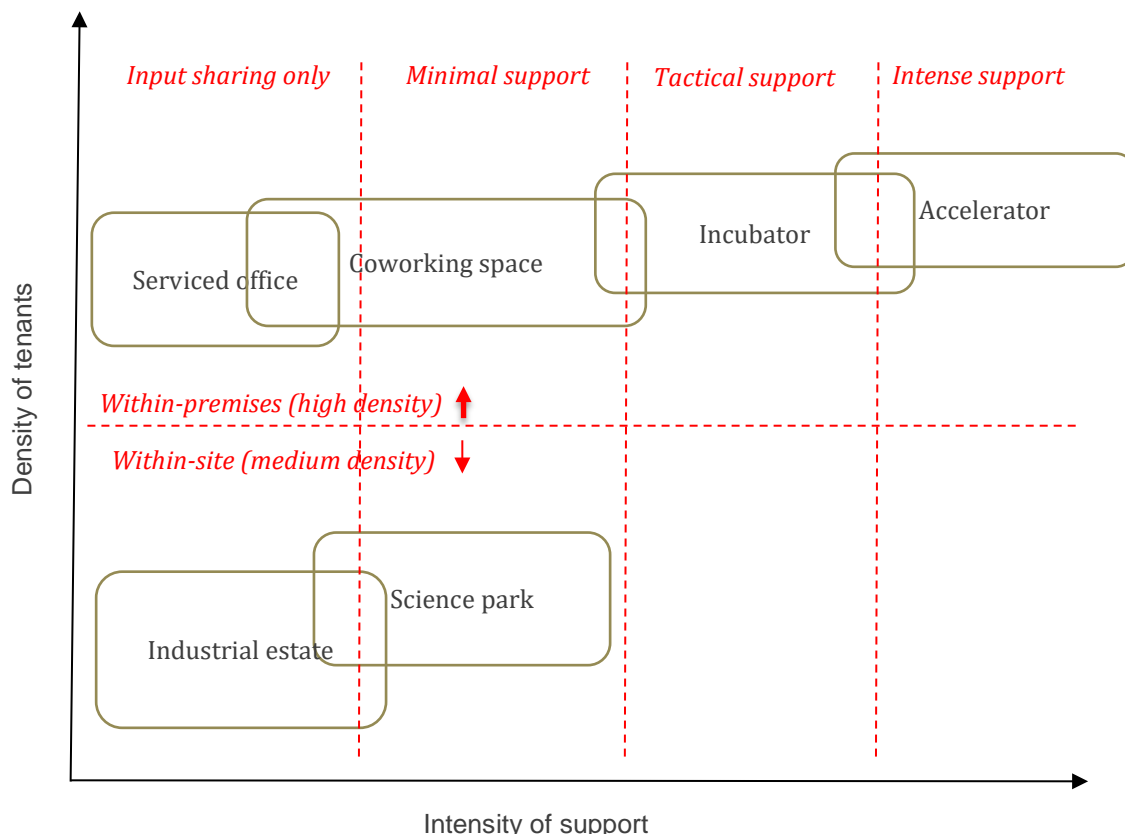
Incubators typically use non-competitive entry and comparatively ‘light-touch’ support,

typically targeting start-ups aged 1-5 years. Incubators are usually non-profit or run as managed workspaces, where firms have rolling contracts and pay rent, staying for between one and five years. Incubators provide workspace and *ad hoc* training relevant to the business (e.g. in accounting). Mentorship is also provided but is often minimal and tactical (i.e. advice as needed), as opposed to the more intense, scheduled, and consistent mentorship provided by accelerators.

As with many new phenomena, an inordinate amount of time is spent on attempting to delineate business models. We find it most useful to think of a simple overlapping categorization according to the density of tenants and the intensity of support, as illustrated in Figure 1.

For smaller, denser spaces, incubators and accelerators are distinctive in their intensity of support. Co-working spaces share some similarities with incubators – in terms of physical set-up, some input-sharing, target clients and (non-competitive) entry. However, there is little or no active management, community curation, or provision of additional services. Intensity of support also helps differentiates incubators and accelerators from serviced offices aimed at established businesses: fully-fitted-out office buildings offering modular space (typically per room or per floor) where the emphasis is on sharing physical inputs.

Figure 1. A typology of co-location interventions.



Of the less dense spaces, science parks facilitate the sharing of physical inputs both high end (university libraries, labs and researchers) and more mundane (meeting rooms, conference facilities and cafeterias). These also play a real estate role: helping firms flexibly adjust their commercial space usage, without undertaking costly re-location. Many parks also offer advice and may help manage companies. Industrial estates have important roles to play in providing space for urban manufacturing, logistics and distribution, and for artists workshops (Wainwright, 2017). Here the emphasis is on input-sharing and flexible commercial space with little, if any, provision of support. We do not consider this category any further in what follows.

4) Drivers

Incubators, accelerators and related spaces are a feature of the UK and other countries' business landscape. As of April 2017, the UK had 771 incubators, accelerators, co-working and related spaces (Bone et al., 2017). Of these 182 were accelerators, 213 were incubators

and 50 were co-working spaces. London had 171, more than the next 10 cities combined.⁴ London exemplifies the rapid spread of such spaces: in 2014, over half the city's provision had been established in the last three years. WeWork, perhaps the best-known provider, had zero London presence at the start of 2017, but 29 offices by November that year.⁵ As of November 2017, user costs in London varied widely, from £35/month for a TechHub desk at Campus London to £450/month for a desk at WeWork Tower Bridge.⁶

Several structural factors, documented elsewhere, explain rising demand for co-working space. The shift in the structure of production away from manufacturing towards services increased the proportion of employment in activities for which the co-working model is relevant. Several forces reinforce this compositional effect. For example, the shift to smaller, more networked firms increases the number of firms benefiting from sharing physical inputs. Space-sharing may also be beneficial if multinational or multi-site firms employ a small number of employees in each location. Shifts in employment patterns - rising self-employment, including sole traders / freelancers – also increased the number of individuals benefiting from sharing physical inputs. More broadly, high and rising urban rents are increasing the benefits of shared space, to both reduce costs and allow for more flexible adjustment as firms grow or shrink.

Why the increased demand for accelerators or incubators, relative to more 'traditional' co-working or serviced offices? Prosaically, the low price for (some) such spaces, versus serviced offices, may be part of the attraction. The high visibility of such spaces, and the large claims made for them, may also increase demand. A deeper reason may be sociological: as self-employment has risen, so entrepreneurial lifestyles have become more fashionable, driving up demand for spaces embodying that lifestyle. We return to these ideas in Section 5.

Some of these factors may be more cyclical than structural. As with any fashion, the desirability of entrepreneurial lifestyles could change quickly and unexpectedly. Growing self-employment is not always a choice, if workers use this as a strategy to deal with lack of labour market opportunity, precarity, or to counter discrimination.

⁴ Birmingham (22), Edinburgh (14), Manchester (13), Oxford (12), Belfast and Cambridge (10) Leeds, Newcastle, Bristol, Sheffield (9).

⁵ <http://www.seed-db.com/accelerators>, accessed 28 March 2017; <https://www.wework.com/l/london>, accessed 22 November 2017.

⁶ <https://www.wework.com/l/london>, <https://london.techhub.com/>, accessed 22 November 2017.

On the supply side long-term shifts from manufacturing to services have meant a move back to urban production.⁷ This facilitates the sharing of fixed costs, including commercial space and other physical inputs (Duranton and Puga, 2004; Duranton and Kerr, 2015). Changes in ICTs, particularly the emergence of cloud, mobile and pervasive broadband, have also reduced the costs of servicing the shifting client base using co-working spaces.

Post-industrial cities also have competing demands for space, especially residential versus commercial (Hamnett and Whitelegg, 2007). It is notable that co-working provision has grown most rapidly in cities with big local tech scenes and expensive housing. In London, for example, residential land is worth 3.2 times more than industrial (Ferm and Jones, 2017). Real-estate business models that raise the effective density of a given building are thus likely to become more popular. Many types of co-working can be offered in a single building; co-working functions can also be combined with operations such as cafes, restaurants and retail. These higher-density uses also drive up landlord yields.

Public policies also influence these dynamics. In the UK, for example, changes to planning policy and local taxation had substantive impacts. Policymakers have provided subsidised workspace for small firms since the 1960s, and many appeared in the 1980s and 1990s in British cities. At this point, around 2/3 were directly managed by the public sector (Ferm, 2014). Since then, there has been a shift away from direct provision, towards ‘affordable’ workspace delivered through planning obligations. Ferm (2014; 2016) suggests these policies have pushed developers to focus on established, high-value tenants, leading to a shortage of space for newer, younger businesses. Around the same time, industrial zoning was relaxed to allow for more mixed-use developments, including live-work spaces (Pratt, 2009). This also permitted gradual shifts towards residential use (Ferm and Jones, 2017; Ferm and Jones, 2016; Cheshire et al., 2014). In 2016, further national policy changes made it easier to convert office and commercial spaces to residential.⁸

Overall, these policy changes and housing market pressures in major cities reduced the supply of affordable, flexible space for SMEs and startups. In turn, this has driven up demand

⁷ The emergence of digitised manufacturing, or ‘Industry 4.0’ (Schwab 2017; Brettel 2014), and related trends such as customisation / bespoke assembly may also lead to rising demand for urban manufacturing spaces.

⁸ <http://lichfields.uk/blog/2016/march/14/office-to-residential-permitted-development-right-made-permanent/>, accessed 15 May 2018.

for cheap, high density, flexible space provision, such as co-working based business models. A further factor, especially in cities, is the 2017 revaluation of business property taxes, which in many cases have substantively increased leaseholder costs, pushing up demand for higher-density as a way of cushioning these cost changes.

5) Frameworks

Impact-testing co-location policies is not straightforward. This is partly because interventions work through several channels. It is also because the current literatures on co-working and researcher co-location are dominated by small-n descriptive comparisons and individual case studies (Schmidt and Banks (2017), Bound and Miller (2011), Dee et al (2011) and Phan et al (2005) provide reviews). While this literature makes important contributions, a more structural framework is also needed. This section presents a first attempt.

5.1) Micro-agglomeration

One way of thinking about co-location tools is as ‘cities in miniature’. Drawing on urban economics, this suggests co-working spaces generate agglomeration economies within a given building. Following Duranton and Puga (2004) they offer combinations of ‘sharing’, ‘matching’ and ‘learning’ economies that drive down costs, and increase innovation and productivity. Sharing effects arise from pooled equipment, facilities, etc. Matching effects from networking or peer-to-peer linkages, which help identify partners. Learning effects are knowledge spillovers and may arise from peer-to-peer interactions, mentoring or networking. Programmes might also generate diseconomies of agglomeration, such as poaching of ideas in environments where secrecy may be hard to maintain.

Real world knowledge spillovers exhibit substantial distance decay, especially for ‘knowledge-intensive’ services (Jaffe et al., 1993; Fleming et al., 2007; Kerr and Kominers, 2015). In professional service industries such as advertising, spillovers may disappear within 250m (Arzaghi and Henderson, 2008). Similarly, case studies suggest that tech and creative industries are often found in small, dense clusters (Martins, 2015; Nathan and Vandore, 2014; Hutton, 2008; Indergaard, 2004). Until recently, however, studies testing for agglomeration effects at the scale of rooms, buildings or campuses have been almost non-existent.

As in cities, the micro-foundations of a programme will depend on the sector mix and business models (norms and untraded interdependencies are the city-level equivalent, as per (Storper, 1997)). Participant surveys commonly suggest that matching and learning opportunities are most helpful – specifically, mentoring, networking and peer feedback (Bone and Burnett, 2018; Seet et al., 2018; Merkel, 2015; Chan and Lau, 2005). Signs and magnitudes are harder to predict *a priori*. For example, accelerators offer more structured and intensive support, but in substantially smaller cohorts than incubators. Specialised programmes could leverage Marshallian knowledge-sharing; cross-industry programmes could exploit Jacobs-style spillovers.

Co-location programmes must rely on the benefits of *close* physical proximity *over and above* everyday urban interactions. This raises the question of whether programme effectiveness is affected by the context. Large, dense urban locations may offer complementary agglomeration economies (say, networks of expertise or specialized support industries) but also imply greater competition.

5.2) Proximity / distance

Urban economics focuses on physical proximity but has traditionally said less about other relationships. Boschma and others (Boschma, 2005; Torre and Rallet, 2005; Boschma and Frenken, 2009) see geographic co-location as one of several ‘proximities’ shaping outcomes. Interactions may also depend on social closeness (e.g. through friendship), organisational (e.g. working in the same firm), cognitive (e.g. the same subject background), or institutional proximity (e.g. common norms).

Boschma argues proximities can be complements or substitutes and may not be beneficial - ‘too much proximity’ can be detrimental, for example if it leads to groupthink. In contrast, Menzel (2015) and Ibert and Müller (2015) see co-location as a way to bridge multiple dimensions of ‘relational distance’, where physical closeness strengthens actor linkages over time.

These perspectives imply that co-location programme providers may need to pay careful attention to the ways in which participants interact. Providers often seek to develop a strong

cohort identity to stimulate peer interactions and develop communities of practice (see below). Co-location allows providers to bridge social and network distance (Menzel, *ibid*). But single industry or highly selective programmes might be less effective if they draw from a cognitively narrow set of participants (Page, 2007).

To date, empirical studies of proximities typically focused on researchers, especially inventors and academics (Balland et al (2015) provide an overview). These studies suggest other forms of closeness may partially substitute for physical closeness, but also that social and spatial proximities can be complements. As in the economics literature, however, few, if any, studies apply these frameworks to co-working spaces and other co-location interventions.

5.3) De-risking entrepreneurship

A third view comes from the management literature. This sees entrepreneurship as a Schumpeterian process of ‘experimentation’ (Howell, 2017; Kerr et al., 2014) or ‘noisy learning’ (Lerner and Malmendier, 2013; Aghion et al., 1991). Entrepreneurs face many uncertainties and risks. Interventions that de-risk entrepreneurial activity increase the chances of success. One way to do this is to provide information and contacts which would otherwise be costly to obtain, or whose importance might not be understood *ex ante* by inexperienced agents. In this view, programmes such as accelerators speed up what would otherwise be a process of trial and error, helping participants identify challenges and fix them. If so, co-location effectiveness may be less about physical proximity and more about other aspects of programme design. This view emphasises the importance of linking programme participants to external expertise, via mentoring and networking; and encouraging individual learning and reflection.

An important implication of this perspective is that programmes may help individual entrepreneurs realise a given idea is not viable. If ‘fixing bad ideas’ involves disbanding or reconfiguring firms, programmes have an ambiguous effect on survival, even if surviving firms perform better.

5.4) Economic communities

A fourth view, based in economic sociology, sees incubators and accelerators as socio-economic communities, providing spaces to develop new ideas and practices, and individual professional identities (Schmidt and Brinks, 2017). This perspective provides insight into how ‘micro-agglomeration’ might work in practice, and sheds light on provider and participant motivations. ‘Entrepreneur’ is a partly public identity (Novick, 2017). In this view, co-working spaces function as shared spaces to develop ‘an ideal entrepreneurial self’, as well as to learn useful practices from peers, mentors, providers and others (Gill and Larson, 2014). Different business models emphasise different aspects of communities of practice (Schmidt and Brinks, 2017). For example, many co-working spaces and incubators are positioned in terms of shared values or working conditions – providers see themselves as ‘mothers’, ‘hosts’ or ‘social gardeners’ creating contexts where any participant can succeed (Merkel, 2015; Peluffo, 2013). In contrast, accelerators use more competitive language of ‘cohorts’ and ‘teams’ and emphasise selective entry and individual achievement over collective success (Bound and Miller, 2011). These studies also highlight the range of participant motivations – some are profit-maximisers, some are more 'lifestyle businesses' – and how this can shape programme choice and levels of participation.

5.5) Testing for impact

This framework raises important questions for policymakers and providers. First, selective programmes may pick the most able firms – most likely to succeed anyway. We thus need robust evaluation designs that control for selectivity. Second, many programmes curate cohorts, or select on ‘potential’, increasing the complexity of selection issues. Cohort selection may emphasise group fit (or diversity) over individual characteristics. Choosing on ‘potential to benefit’ may imply negative selection by excluding experienced businesses. This means it is crucial for policymakers to understand programme-level objectives and selection decisions in detail.

Third, participation in prestigious programmes may have a strong signalling effect distinct from programme content. To the extent participation raises profile, the initial selection decision improves outcomes. Comparing across more and less well-known programmes may help estimate prestige effects. Fourth, we need to understand the importance of physical co-

location, versus other programme components. This is particularly important for accelerators, given co-location requirements vary substantially – some require participants to be on-site; others resident in same city; others deliver face to face but have no residence requirements. This also carries implications for incubators and co-working spaces, which involve long-term physical proximity. For policymakers, greater understanding will help determine support for co-location approaches versus conventional business support tools.

6) Findings

6.1) Provider attitudes and behaviour

Interviews with incubator and accelerator providers illustrate how participants are chosen and confirm the business model differences discussed earlier. Selection decisions rarely involve choosing ‘the best’ firms on some objective function; rather, providers typically select across a range of characteristics, including competence, experience, potential and ‘fit’ (to programme and other applicants). In many cases scoring is only a decision guide and selector discretion may lead to lower-scoring firms being selected.

These behaviours reflect the reality that many applicants are young firms, so there is little evidence on which to judge ‘performance’. Some programmes that select on ‘potential’ choose younger, less experienced firms over more experienced, better-financed businesses. This implies evaluation may need to look at distance travelled, as well as raw effects.

6.2) Overall outcomes

The available evidence on overall outcomes is fairly clear-cut. One key finding is that accelerators and incubators seem to increase participating firm employment. There is more evidence for accelerators than incubators: three studies find accelerators have a positive effect. Two further studies also report positive effects, but they pool both accelerators and incubators.

Five studies consider the impact of accelerators on subsequent external funding (e.g. from angel investors or venture capital). Four find positive effects, while one finds no effect. One

study, looking at two prominent private sector accelerators, finds *length of time* spent in-programme is negatively associated with funding. We found no studies looking at incubators and external finance.

Five studies consider the impact of accelerators on survival: findings are positive in one case, mixed in one (positive for women and minorities), zero in one and negative in the other two. Again, there is more evidence for accelerators than incubators: only one study looks at survival effects of incubators, focusing on five German incubators, finding a negative effect for three and no effect for two. At face value, this suggests programmes may hasten firm demise: an alternative – more plausible – explanation is that they help participants to quickly gauge the quality of their ideas (e.g. via investor / peer feedback) and encourage those with weak propositions to quit early. Provider interviews support this interpretation.

6.3) Programme design

It is harder to draw clear conclusions for programme design: few studies robustly test the effects of design choices. For example, length of time spent in an incubator is, at best, weakly associated with improved outcomes. One study finds positive effects on revenues, no effect on survival and negative effects on the likelihood of graduating and getting funded. A second also finds negative effects on graduating but a positive effect on survival – i.e. the longer firms stay in an incubator, the more likely they are to stay in business. Finally, a third study reports a negative effect on survival and no effect on sales or employment. For accelerators, there is no evidence on programme length either way.

For incubators, there is some evidence university involvement improves outcomes; perhaps not surprisingly, institutional affiliation and professional staff support seem more useful than individual academics. Four studies evaluate the impact of academic roles on companies in incubators. Two compare university-affiliated and non-affiliated incubators, with one finding university links have no effect on revenue or employment, but a positive effect on survival, and another finding a positive effect on both revenue and employment. A third study finds academic involvement has no effect on revenue – but that using university research increases the likelihood of obtaining venture capital, and the amount of funding. The fourth finds academic involvement may increase the likelihood of survival but may also have a negative impact on graduation from the incubator. For accelerators, we again found no evidence either

way (probably because universities are less likely to be involved).

There is some evidence suggesting that the wider context in which an incubator or accelerator is located influences success. Two accelerator studies find accelerated firms located in competitive areas (i.e. more dense entrepreneurial networks) are more likely to increase employment and gain funding. One incubator study finds that locating in competitive areas has no impact on revenue or employment but decreases the likelihood of survival. This handful of studies suggest that dense, competitive (i.e. urban) environments can magnify success, but also decrease the survival of less capable firms. An additional study finds programme design interacts with the wider context – in particular, competitive environments might make networking and training programmes more effective, and specialisation (i.e. housing one type of firm) less effective.

There is some evidence from two studies on which firms benefit most. One study finds firms headed by females or members of a minority benefit more from accelerator programmes, while another finds the same for incubator programmes, particularly in competitive areas.

There is even less evidence on other design issues. Only one study considers sectoral mix. There are no clear differences in outcomes when comparing public and private sector-run programmes.⁹ Finally, we found no studies directly comparing the two approaches, so we know little on the value added of accelerator vs. incubators.

6.4) Co-locating researchers

The evidence on researcher co-location turns up some related findings (although results may not directly transfer). Overall, the results emphasise the importance of close co-location (in the same building or room); they also suggest spillovers are greatest between researchers in related fields, something the co-working literature hasn't looked at in detail.

First, close co-location – within university campuses or specific buildings – can have a positive effect on the probability of research collaboration and on research quality. Two

⁹ For funding, one US study finds that for private sector-run programmes, quality matters – “top” accelerators had positive effects while others did not.

studies explore this. One looks at research office layout finding ‘walkability’ between researchers makes collaboration more likely. A more robust study finds that researchers in laboratories becoming randomly co-located were more likely to collaborate, to research similar topics and to cite the same research. Separation of previously collaborating labs did not lower the future probability of collaboration, but did lower the quality of research, with researchers exploring divergent topics and citing different research. This suggests distance increases search costs partly determining research partnerships, but that collaborations are persistent. Similar patterns exist at larger scales, in line with the wider agglomeration literature. Co-location in science parks is associated with higher firm-level patenting but spillover effects may die away rapidly with distance. One of two studies suggests positive spillovers within science parks operate over small scales, disappearing for firms located more than 240 metres apart.

The second main result is that spillovers may exist between researchers in different academic fields or commercial sectors, but the greatest positive effects of co-location occur for researchers and firms undertaking similar activities. The evidence supporting this finding is quite diverse, and more research is required to be fully confident of this.

The two science park studies also find positive effects on patenting both within and across industries for firms in the park. Another study, which focuses on academic activity around the UK’s Diamond Light Source Synchrotron, finds the strongest positive effects on research output directly using Diamond, although weaker effects are also found for related research.

One study finds researchers who work near each other are more likely to collaborate. It exploits a natural experiment whereby researchers were randomly allocated offices. Laboratories in the same tower or corridor were more likely to collaborate and co-author than those that were not. Similarly, two studies looking at temporary researcher colocation at conferences find bigger collaboration effects on researchers in similar fields. Attending the same conferences has a significant impact on future collaboration – especially if in a similar field. The ‘temporary co-location’ effect is bigger where researchers are junior, at least one is female and for non-presenters. The stronger of the two studies (an RCT) suggests having previously collaborated increases the ‘event effect’ – but the other study says the opposite. We have no clear evidence whether prior collaborations are likely to lead to future collaborations. However, studies on research lab breakup – discussed above – suggest prior

collaboration patterns matter a lot.

7) Conclusions

A large body of evidence links physical proximity to innovation and entrepreneurship. Co-location interventions aim to use close proximity to encourage creativity and ideas exchange, or to de-risk entrepreneurial activity. They are potentially important policy tools. We suggest that co-working spaces, incubators and accelerators can be conceived of in four ways: as cities in miniature; as tools for bridging or structuring a range of relational distances or proximities; as ways to structure and de-risk entrepreneurial learning; or as economic communities or communities of practice.

Our OECD-wide evidence reviews generate three main conclusions. First, there is fairly clear evidence incubators and accelerators work overall - for survival, employment growth and receiving external finance.

Second, we have much less clarity about how programmes achieve results. There is suggestive evidence accelerators work better in rich urban milieux, that university involvement can help, and that female/BAME-headed businesses may benefit even when the average firm does not. Evidence from academic collaboration suggests close physical co-location (permanent and temporary) is helpful, as is same-field or closely related activity. But it is not clear if these findings transfer from researchers to entrepreneurs.

Third, this raises several design questions for policymakers and programme providers. Researchers should work with practitioners to test the role of the public versus the private sector; sector mix versus sector specialism; impacts on different social or economic entrepreneurship groups; selection and signalling effects versus in-programme content; and the relative effectiveness of co-working, incubators, accelerators and 'conventional' business support without co-location.

We also think that understanding the proximity micro-foundations can help us better understand more complex urban-level production milieux, and thus inform economic development policies. For example, the evaluation evidence suggests accelerator programmes

are complementary to wider agglomeration forces, specifically the cross-industry matching and learning processes typically found in larger cities (Jacobs, 1969). In theory, accelerator provision could help strengthen a cluster by improving productivity advantages of cluster location. However, it is unclear what the effect size would be, or what would comprise critical mass - how many spaces are needed, and how many firms 'treated'? Which sectors would most benefit from expansion in provision, or would effects be visible cross-industry? A further question is why, so far, we do not appear to see such linkages for incubator programmes.

We also know clusters are characterised by positive and negative feedback loops (Nathan and Overman, 2013). Productivity effects grow with cluster size, as the set of knowledge spillovers gets larger and richer; at the same time, growing clusters become progressively more crowded and expensive, often displacing smaller or newer firms. Co-working-based interventions can - in theory - simultaneously increase cluster productivity for a given size (by enabling innovation and entrepreneurship) and flatten the cost curve (by more densely co-locating firms in physical space). What might be the effect size of such provision, at what scale, and how might such interventions shape cluster lifecycle trajectories (Boschma and Fornahl, 2011; Martin and Sunley, 2011)?

We look forward to future research tackling these issues.

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