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by

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The Regional Emergence of Innovative Start-ups: A Research Agenda¹

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Abstract

This paper reviews the empirical evidence concerning the regional emergence of innovative new businesses. It is argued that analyses using aggregate data that focus on the regional level and do not account for career patterns of innovative founders are of limited value in guiding policy that is aimed at fostering the emergence of innovative new businesses. Progress can be mainly expected from research that investigates the family backgrounds, education, and employment careers of potential founders. Moreover, it would be helpful to develop clearer empirical definitions of what constitutes an innovative new business, and the distinctions between different types of innovative businesses.

Keywords: Innovative start-ups, universities, employment career

JEL codes: L26, D22, O31, R12, R30

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1. Introduction

There is good reason to believe that innovative new businesses are of key importance for regional development (Schumpeter 1934; Colombelli, Krafft and Vivarelli 2016; Fritsch 2011). The huge variation in the number of such innovative start-ups across space clearly indicates that region-specific factors are important in this respect.³ The role of regional conditions in the emergence of innovative new businesses is, however, still not well understood. What is mostly unclear is the effect of higher education institutions, of other public research institutes as well as of research and development (R&D) activities of incumbent firms. How is the knowledge of these organizations transferred to new businesses, and where are these new businesses located? What other local conditions may play a role? Valid responses to such questions are especially important for the design of policies that aim at stimulating the emergence of innovative start-ups, particularly policies that want to foster knowledge spillovers and improve the ability of academic institutions to positively impact the economy.

The following sections briefly summarize existing theory (Section 2) and outline the key results of empirical research about the emergence and location of innovative start-ups (Section 3). Section 4 derives a number of important research questions, and Section 5 discusses research designs that are suited to provide answers to these questions. The final section (Section 6) concludes. Since the focus of this contribution is on regional analyses, I will not discuss factors that may determine the emergence of innovative start-ups at the national level, such as the protection of intellectual property rights, administrative entry barriers, competition policy, labor market regulation, the tax regime, health insurance, etc. (see Feldman, Lenahan, and Miller 2011; Henrekson and Johansson 2011; Elert, Henrekson, and Stenkula 2017). Such regulations typically do not

³ See, for example, Bonaccorsi et al. (2014) and Colombelli (2016) for Italy, and Audretsch, Lehmann, and Warning (2005) and Fritsch and Aamoucke (2013, 2017) for Germany.

vary across the regions of a country, and an empirical analysis of their effect requires international comparisons.

2. The emergence and location of innovative start-ups: theory

The theory of occupational choice (Lucas 1978; for an overview see Parker 2018) suggests that someone will start an own business if he expects higher returns in self-employment than in paid employment. Based on this notion, the decision to start an own business does not just depend on a person's entrepreneurial abilities, but on the monetary and non-monetary benefits of applying personal knowledge and skills in self-employment instead of paid employment.

The knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013) builds on this basic calculus. The theory asserts that knowledge that is generated by incumbent firms, universities, non-university public research institutes, or other sources may empower someone to generate a business idea based on an innovation that he believes to be economically valuable. Since the economic value of new knowledge is highly uncertain, the expectations about the returns of any new idea will vary across economic agents. Hence, if an employee in a firm assigns a much higher economic value to a new idea than does the management of that firm, the employee may be motivated to start an own business based on this idea because he expects higher returns in self-employment than in paid employment (Acs et al. 2009, 2013).

A main reason why an employee becomes the founder of a new innovative firm is that new knowledge and business ideas cannot be easily communicated or traded on a market. Hence, to start an own firm may be the only feasible way to see the idea realized, which can represent a considerable non-pecuniary return of being self-employed. This motivation may particularly hold for research staff in universities and other public research organizations where legal restrictions for the commercialization of knowledge apply. Via spin-offs, knowledge of the incubator organization spills over to the newly founded firm, and thus, the knowledge base of the

incubator firm can have a significant effect on the number and the success of its spin-offs (Klepper 2009, 2016).

In this process of entrepreneurial knowledge spillover, the regional dimension is relevant for at least three reasons. First, new knowledge and ideas do not flow freely across space but tend to be regionally bounded (Asheim and Gertler 2005; Boschma 2005). Second, founders show a pronounced tendency to locate their firm in close spatial proximity to their former workplace, or their residence (Figueiredo, Guimaraes, and Woodward 2002; Dahl and Sorenson 2009). Hence, innovative entrepreneurship is, in most cases, a “regional event” (Feldman 2001; Sternberg 2009). Third, because entrepreneurship tends to be a regional event, the local conditions for entrepreneurship are important factors in the emergence and the success of innovative new businesses. This includes the regional knowledge stock, knowledge spillovers, as well as the availability of appropriate labor, finance, and other resources that the start-ups need to survive and grow. Market success and the growth of spin-offs can create agglomeration economies that may be conducive to their future performance (Boschma 2015; Klepper 2010, 2016). A fourth reason why region-specific factors can be important is that certain places may attract potential founders from other regions to settle down and eventually start a firm. Reasons why certain regions attract entrepreneurial people could be the existence of favorable conditions for innovative entrepreneurship, but it may also be other factors such as a climate of creativity and tolerance (Florida 2002; Florida, Adler, and Mellander 2017), or simply that it is the place ‘to be’.

3. What we know about the regional emergence of innovative start-ups

3.1 Identification of innovative start-ups

A key problem confronting empirical studies investigating the formation of innovative new businesses is the identification of this type of start-up. In order to qualify as a start-up, the respective economic entity must be a

new organization, not just a takeover of an already existing company. Spin-offs that emerge from existing firms or research organizations should, of course, be classified as start-ups. In the broadest sense an innovative start-up is any new business that supplies new products, uses new methods of production, or accesses new markets of suppliers or customers (Schumpeter 1934). Applying such a broad definition of innovation leaves room for distinguishing between different types of innovation (e.g., product, process, organizational, procurement, and marketing innovation), as well as different degrees of innovativeness. According to such a wide definition, there may be countless varieties of innovative new businesses based on one or another category, or on the degree of 'newness' introduced.

Since innovation is a process, the innovativeness of start-ups may be captured by information about their inputs or outputs. Input and output are, of course, linked, but the relationship tends to be fairly stochastic. Accordingly, there are some cases where innovative effort does not lead to any innovative output, and other cases where innovative output requires little significant innovative input in terms of R&D. Hence, using either measure of innovativeness involves considerable problems.

First, it is not entirely clear what types of inputs (in terms of effort or activities) should be considered R&D (OECD 2015). The innovativeness of an output (the product or the respective production process) involves the problem of assessing its newness.⁴ Given that the key motivation for investigating and analyzing innovative start-ups is their effect on the economy, one may conclude that it is probably more appropriate to assess their innovativeness on the output side of the innovation process. However, because the problems of measuring innovative input tend to be

⁴ The European Community Innovation Survey (CIS) is a prominent example of an attempt to assess the innovativeness of innovation on the output side (OECD 2017). The underlying questionnaire asks for type of innovations (e.g., product, process, procurement, marketing), and their market scope (new to the market vs. new to the enterprise).

less severe than measuring innovative output, most classifications of innovative start-ups are based on information about the input side.

A common criterion to identify and classify the innovativeness of firms is based on the amount of resources that they devote to R&D. Accordingly, firms or industries are regarded as “innovative” if they devote more than 3.5 percent of their inputs to R&D, and they are considered to be high-tech if this share is more than 8.5 percent (OECD 2005, 166-171). Since information about the R&D input of individual firms is frequently not available, it is common practice to identify innovative businesses based on their industry affiliation. The OECD (2005) has proposed a widely accepted classification that is based on the knowledge requirements and R&D intensity of industries, as well as the innovativeness of their product programs. This classification distinguishes between “high-technology”, “medium-high-technology”, “medium-low-technology”, and “low-technology” industries. While this typology is limited to manufacturing industries, it is common practice to also classify certain service sector industries as being “knowledge-intensive” (see, for example, Eurostat 2018).

Classifying an industry based on its innovativeness also has a number of problems. First, what may be a non-innovative product or industry in one country may be quite innovative in another. It may, therefore, be appropriate to adjust this classification to the specific characteristics of countries. Second, the innovativeness of industries and products may change over time and require respective adjustments. Third, industry affiliation is a rather fuzzy distinction because there are innovative and not so innovative firms in all industries. Hence, even a well-developed and up-to-date industry classification listing leads to a somewhat diffuse picture of innovative and non-innovative entries. Given the limited availability of data on innovation activity, this is, however, often the only feasible way to identify such new businesses, at least in aggregate level analyses.

Another criterion for the identification of innovative start-ups is their ability to attract Venture Capital (VC) (Breschi, Lassébie, and Menon 2018; Azoulay et al 2018). VC is equity financing earmarked for promising young businesses. VC investors normally make a detailed assessment of the prospects of a project before they invest their money. Using this approach outsources the decision of what might or might not be considered innovative to VC firms. Since start-ups that receive VC should be of relatively high quality, especially with regard to their growth prospects and profitability, this approach is similar to assessing the output side of the innovation process. One weakness of using this approach to identify innovative start-ups is that it identifies only those new businesses that have good prospects for growth and profitability. Although one may expect a relative pronounced role of these entries for economic development, other new businesses that may not appear to be so obviously promising, but may also make a significant contribution to growth, are completely disregarded. Another weakness is that, although high growth prospects and profitability frequently include an innovation in the broadest sense, firms that attract VC may not be particularly innovative. But, even if these start-ups are innovative, VC investment does not tell us anything about the type of innovation. Moreover, it is not entirely clear if VC firms prefer to invest in a certain venture simply because of the spatial proximity of the venture (Sorenson and Stuart 2001; Fritsch and Schilder 2008, 2013).

It may also be important to distinguish between VC originating from exclusively private firms and VC from public or semi-public financiers, because public investors frequently use different criteria for evaluating investments. Generally, private VC investors tend to be more interested in gaining a high return than public investors. Hence, private investors often offer more support and consulting in an attempt to make the firm more profitable and encourage growth. Another critical difference is that private VC firms are very hesitant to invest in the early stages of an innovative start-up, while public VC financing may have the purpose of supporting

innovative start-ups during the early stages of business development (Lerner 2002; Grilli and Murtinu 2014).

A further way of identifying innovative new businesses is based on intellectual property rights, specifically patents, that are involved in a start-up (Azoulay et al. 2018; Breschi, Lassébie, and Menon 2018).

Accordingly, a new business is regarded as innovative or knowledge intensive if the firm or its founder owns such property rights.⁵ Again, there are several problems involved in such a definition. First, classifying only those start-ups as innovative that own intellectual property rights disregards many innovative firms that do not fulfil this criterion. Second, there are types of inventions that cannot be patented (e.g., basic research), and there are inventions for which patent protection may not be regarded as appropriate (Hall et al. 2014; Walter, Schmidt, and Walter 2011). Third, firms in the early stages of development may not have the financial resources to provide comprehensive protection for their intellectual property, or it may just appear to be too expensive to them.

Attempting to classify spin-offs from universities and other research institutes as innovative may hold for most firms founded by faculty, but it could be completely misleading by ignoring that start-ups by former students include many businesses such as medical practices, law offices, accounting firms, etc., that are knowledge-intensive but not particularly innovative. Hence, more information about the nature of a business is needed in order to identify innovative university spin-offs.

3.2 The macro-level pattern

Empirical research that relates the number of innovative start-ups in a certain region to the specific characteristics of that region, has found pronounced correlations between the emergence of innovative new businesses and the level of private sector R&D activities (i.e., presence of

⁵ Since intellectual property rights, such as patents, constitute an intermediate result of an innovation process that can hardly be traded, they could be classified as an input as well as an output of the innovation process.

innovative incumbent firms), as well as the presence, size, and type of higher education institutions (HEIs).⁶ Regions with large numbers of innovative start-ups also tend to host numerous VC investors (Fritsch and Schilder 2008). Most of the aggregate level analyses that distinguish between different fields of knowledge find a pronounced correlation of higher education and research in engineering and natural sciences with the numbers of innovative new businesses, while activities in social sciences or arts turn out to be hardly significant (Fritsch and Aamoucke 2017).

Fritsch and Wyrwich (2018) find that many German regions with high start-up rates in innovative and knowledge intensive industries today also had high levels of science-based self-employment more than 80 years early. They conclude that such a long-lasting tradition of innovative entrepreneurship has resulted in a regional culture of entrepreneurship, i.e., a high level of social acceptance of entrepreneurs and entrepreneurial behavior that is conducive to new business formation and growth (for details see Fritsch and Wyrwich 2019). Consistent with this interpretation, it is found that individuals living in regions with a pronounced tradition of self-employment tend to have a personality profile that is similar to the profile of entrepreneurs (Fritsch, Obschonka, and Wyrwich 2018).

Based on a rich dataset about several types of activities of German HEIs, Fritsch and Aamoucke (2013, 2017) investigate the relationships of different measures of the activities of HEIs with the numbers of high-tech start-ups. They find that the correlation between the number of innovative start-ups and HEIs is based more on the number of professors than the number of students or graduates. This result may be, at first glance, rather surprising, because there are more start-ups initiated by students or graduates than by faculty simply due to the fact that the number of

⁶ Audretsch and Lehmann (2005), Audretsch, Lehmann, and Warning (2005), Bade and Nerlinger (2000), Baptista, Lima, and Mendonça (2011), Bonaccorsi et al. (2014), Colombelli (2016), Fritsch and Aamoucke (2013, 2017), Harhoff (1999), Hülsbeck and Pickavé (2014).

students is much larger. Moreover, members of faculty, especially if they have tenure, show a considerably lower propensity to set up an own business than graduates (Astebro, Bazzazian and Braguinsky 2012; see also Fritsch and Krabel 2012).

The correct interpretation of this result may be that the number of professors represents the knowledge stock of HEIs that resides in their scientific staff. Since it is mainly the professors who are key to organizing research and applying for research funds, the number of professors can be viewed as a main indicator for the amount and the quality of available knowledge. Hence, the high correlation between the number of professors and the number of innovative start-ups suggests that the size and the quality of the regional knowledge base is more important than the number of students and graduates. However, because of rather high correlations between the different indicators for characteristics and activities of HEIs, Fritsch and Aamoucke (2013, 2017) warn that this result should be regarded with considerable caution.

Many studies find that most high-tech start-ups are located in close proximity to HEIs, and that their numbers sharply decrease as the geographic distance from a HEI increases. This pattern is consistent with the idea that it is the spillovers of spatially-bounded knowledge from HEIs that leads to the emergence of the new businesses, and that the process of transforming knowledge into innovative new businesses is highly localized. In particular, it may be concluded that the local HEIs are the sources of the innovative start-ups in the region.

This interpretation of the empirical evidence could, however, be somewhat misleading because the correlation between the local HEIs and the number of innovative start-ups does not necessarily indicate a causal relationship. The main reason why the correlation between local HEIs and the number of innovative start-ups may not represent a causal relationship is that most founders work as paid employees before starting an own venture. Due to the spatial mobility of founders before they switch into entrepreneurship, significant pieces of the knowledge that is used to start-

up an innovative business may not necessarily stem from the same region where the new business is set up. Founders of innovative firms are highly qualified, most of them holding an academic degree, and tend to live in or around larger cities because this is where most of the respective jobs are located.⁷ Since founders have a strong tendency to set up their businesses close to their place of residence (Figueiredo, Guimaraes, and Woodward 2002; Stam 2007; Dahl and Sorenson 2009), innovative start-ups are most likely to emerge in or close to larger cities because this is where most of the potential founders reside.

A recent study by Konon, Fritsch and Kritikos (2018) investigated the effect of the business cycle on start-up activity in different industries in Germany. The study revealed that new business formation in innovative manufacturing industries is countercyclical, meaning that more businesses in these industries are set up in recessions than in boom periods.⁸ The authors speculate that perhaps relatively low labor costs and the exceptional availability of resources (i.e., qualified labor and available floor space) motivates this timing of a start-up. Another explanation could be that highly qualified employees with a business idea are more likely to react to real or expected unemployment by founding a firm than less qualified persons.

3.3 Micro-level evidence

The public discourse about the emergence of innovative start-ups is often biased by reports about some exceptionally successful new ventures that include the biographies of their founders. In spite of a possible bias, it is undisputed that most of the founders of innovative businesses had at least some contact with universities, and that most of these founders hold an

⁷ Firms with multiple branches typically base their headquarters and conduct most of their R&D activities in larger cities. It is also the case that larger cities host more and often larger HEIs.

⁸ This is particularly remarkable because new business formation in small scale industries where entry costs are relatively low (e.g., personal services, hospitality) and where one would expect higher levels of necessity-motivated start-ups during recessions do not show such a countercyclical pattern.

academic degree. Some of the well-known entrepreneurial superstars whose stories are a topic for the media (e.g., Bill Gates, Mark Zuckerberg) did, however, not complete their university degree but dropped out of academia in order to establish their business venture at an early age.⁹ These types of examples have fueled the myth of the young founder of innovative businesses who has at least some academic training. This myth may be one reason why a number of countries have introduced policy programs that are designed to support university students and graduates to start-up an own business (e.g., the EXIST program in Germany).

However, the broader empirical evidence about the founders of innovative new businesses contradicts the picture of the young high-tech entrepreneur who spins-off directly from a university. In contrast to this popular image, most founders of innovative firms in countries such as Germany and the US do not set up their business directly after completing a university education, but first work for a longer time period as paid employees (Metzger et al. 2010; Müller 2010; Azoulay et al. 2018; Breschi, Lassébie, and Menon 2018). This is well reflected in the fact that the age of the average founder of an innovative firm in Germany and in the US is about 40 years or older, which is not significantly different from the average age of people who set up businesses that are not particularly innovative.

The fact that most founders of innovative firms first work as paid employees for a period of more than ten years has a number of important implications.

- First, they add considerable practical experience and knowledge to their university education before they become founders. While working as paid employees, they may accumulate business skills and improve their abilities to recognize entrepreneurial opportunities through their contact with customers. This knowledge and experience may not only affect

⁹ Steve Jobs, the founder of Apple, is a famous borderline case in this respect because he was enrolled for a short period of time but did not attend classes.

their decision to start up and the relative success of the business, but also the type of business that they found (Braguinsky, Klepper and Ahyama 2012). As a result, many of these founders set up firms with business models that are quite similar to those of their former employers, and the knowledge base of the incubator firm has a significant impact on the success of the spin-off (Klepper 2009).

- Second, given that university graduates tend to show a relatively high degree of spatial mobility (Faggian, Rajbhandari, and Dotzel 2017) combined with the observation that founders have a strong tendency to locate their venture close to their place of residence, many innovative businesses will not be set up in the same region where the founders received their academic education. Hence, the academic knowledge that they acquired during their study may be commercialized in a different location. Florida (2002) claims that creative people have a pronounced preference to work in regions with high shares of other people with creative activities, especially in large cities (see also Florida, Adler, and Mellander 2017).
- Third, assessing whether or not academic institutions are fertile ground for the formation of new businesses requires information about the entrepreneurial activities of former students and employees that covers a longer period of time, i.e., their whole professional life (one such example is the MIT Alumni Study; see Roberts, Murray, and Kim 2015). Most current assessments are, however, based only on the relatively small number of start-ups that are direct spin-offs of an academic institution, or only on those foundings for which the academic institution consciously provided support. Because this type of evaluation disregards the far larger share of new businesses that are set up by alumni long after they have left their university or research institute, it is only of rather limited value for deriving any policy conclusions.
- Fourth, at the time of start up (usually more than ten years after leaving their university), most founders have lost contact with their alma mater.

If academic knowledge is an important input for their venture, contact and cooperation with academic knowledge sources have to be newly established. These sources of knowledge may be different from those where the founder received his academic education.

Astebro and Thompson (2011) found that independent inventors in Canada who have been self-employed for some period of time do change their employers, their occupational field, and the industry they work in more often than those who remain in paid employment. This observation may suggest that innovative entrepreneurs have a special taste for variety. Elfenbein, Hamilton, and Zenger (2010) show that innovative founders in the US tend to switch from larger firms to smaller firms before setting up an own business. The authors argue that this labor market mobility pattern may be explained by a preference of potential founders for autonomy that tends to be higher in smaller than in larger firms. The results of Elfenbein, Hamilton and Zenger (2010) also suggest that innovative start-ups tend to be economically more successful if the founder worked in a small firm before becoming self-employed.

The public discourse about entrepreneurial superstars also touches upon a specific entrepreneurial personality profile of these people. Recent research has, indeed, identified certain personality profiles that are more conducive for starting a business (Caliendo, Fossen, and Kritikos 2014; Obschonka and Stuetzer 2017). This research is mainly based on the Big Five approach to personality measurement, and suggests that entrepreneurs score relatively high on “extraversion”, “openness to experience”, and “conscientiousness” but relatively low on “agreeableness”, and “neuroticism (emotional instability)” (Obschonka and Stuetzer 2017).¹⁰ Although such personality traits may be partly genetic, a considerable part of a person’s personality is influenced by socialization and education, meaning that entrepreneurs can also be ‘nurtured’.

¹⁰ It is, however, an open question, whether or not (and if yes, to what extent) the personality profile of innovative founders differs from the profile of non-innovative founders.

Socialization and a person's personality profile can have an effect on career choices, i.e., what kind of interests and qualifications someone develops (e.g., field of study), what type of occupation that person chooses, etc. (Sorgner and Fritsch 2018). It remains, however, largely unclear how schools and universities could affect the personality profiles of their students and improve their entrepreneurial abilities (see Martin, McNally, and Kay 2013).

3.4 Intermediate summary

Summarizing the state of the art of what we know about the emergence and location of innovative new businesses, it can be said that academic knowledge plays a role in most cases, but that it is not necessarily the knowledge of HEIs, other public research institutes, and private businesses in the region where an innovative firm is established. Hence, empirical analyses that relate the number and performance of innovative start-ups to knowledge sources that are located in the respective region may be of limited value for understanding the emergence and location of innovative start-ups. In particular, such studies may provide a rather poor empirical basis for the design of policies that aim at increasing the number of innovative new businesses.

For developing appropriate policies, much more should be known about the personality, social environment, educational achievement, career paths, and spatial mobility patterns of innovative firm founders as compared to founders of non-innovative businesses (Sorgner and Fritsch 2018). Investigation of such questions, especially of the self-selection of people into certain occupational and regional environments, requires longitudinal analyses for representative samples of people at the micro-level.

4. Research questions

The current state of knowledge about the traits of innovative founders and where they are located leaves a number of unanswered questions that

deserve further research. The following list is a selection of topics that may be relevant for policymakers who intend to design promotion programs that aim at increasing the regional number of innovative new businesses and improving their performance.

The first question pertains to the definition of innovative new businesses and is of key importance for everything that follows. Is it useful and empirically feasible to distinguish between different categories of innovative start-ups based on the type of market or industry, type of innovation (product, process, organization, procurement, or marketing), or the level of innovativeness? If it can be shown that these distinctions are useful and important, and if an appropriate solution to the empirical identification problem can be found, it would be interesting to determine if alternative methods of identification (such as industry affiliation, VC investment, or patents) create a bias that results in over- or underrepresentation of the different types of innovative start-ups?

It was argued in the previous section that a better understanding of the emergence and location of innovative start-ups requires micro-level analyses with representative longitudinal data sets. This type of analysis could enable us to find answers to a variety of questions:

- What is the main motivation for setting up an innovative business? What impact does a dispute with an employer, or frustration with not being able to realize an own idea in an incumbent organization (Klepper 2009) have on the type of innovative start-ups?
- To what extent are the personality profiles of people who set up innovative firms different from the profiles of founders of not particularly innovative firms? For example, are innovative founders more willing and able to cope with risk than those who set up less innovative new businesses?
- How are founders who start their businesses immediately after graduating from an academic institution (students and scientists) different from those who spin off a private firm after having worked there

for several years? Are there any systematic differences between the two types of innovative businesses with regard to the newness of their product or business concept, the type of innovation, and their economic success (Müller 2010)? Are innovative start-ups that are directly set up out of academia based on more recent research than firm spin-offs?

- In what field of activity (e.g., R&D, marketing, management) do founders of firm spin-offs work as paid employees before starting their venture? To what extent are different types of work experience of founders in private firms conducive to the survival and success of innovative entries?
- Do founders who set up an innovative business directly out of academia need more support in terms of coaching than firm spin-offs? Are they more responsive to such support? Should different policies be applied to these two types of innovative start-up?
- What are the typical labor market mobility patterns of those founders who set up their business after a considerable time as paid employee? Do these founders change their employer more often than non-innovative founders, or compared to people who remain in paid employment (Astebro and Thompson 2011)? Do potential founders of innovative businesses prefer to work in smaller firms before switching into entrepreneurship (as claimed by Elfenbein, Hamilton, and Zenger 2010)?
- What is the role of the regional social climate and a regional culture of entrepreneurship for the individual decision to start an innovative business (Obschonka et al. 2015; Fritsch and Wyrwich 2018)?
- Do potential founders of innovative firms have preferences for certain types of regional environments, such as large cities with a high share of creative people, a tolerant atmosphere and a rich supply of artistic activities (Florida 2002; Florida, Adler, and Mellander 2017)? Does the presence of VC corporations play a role in the locational choice of potential founders?

Alumni studies that follow former students over their entire careers or work experiences would allow for the assessment of how many innovative start-ups a certain HEI has generated. Based on such data one could analyze the factors that make universities good seedbeds for innovative start-ups and what characterizes an entrepreneurial university.

5. How to proceed?

A key task for future research should be to clarify the fuzzy issue of 'innovativeness'. Should different types and intensities of innovation be distinguished? What kind of information can and should be used for such a classification? This is important in order to bring the research and discussion about innovative start-ups into sharper focus. Having a valid and precise set of definitions might help us to determine whether or not different studies are actually researching the same fundamental questions.

In light of our discussion about the shortcomings of macro-level analyses concerning the emergence and location of innovative new businesses, it is clear that identification of the relevant causal relationships requires micro-level investigations based on comprehensive and representative data about founders and their firms. Preferably, such data have a panel structure and cover long periods of time. The longer the time period covered the better the possibilities of identifying long-term relationships, such as the effects of childhood and early education on a person's behavior and performance later in life. When exploring the role of regional conditions, and especially the self-selection of potential founders into certain regional environments, obviously the data should include information about the location of the founder and about spatial mobility over the covered period. To be able to analyze the relationship between the characteristics of the founder and the qualities of his venture, especially its performance, it should be possible to link the information about founders with the information about their firms.

Case studies of single founders and their firms may fulfil these demands and can lead to valuable insights. However, because such case

studies typically comprise only a few examples (often just one case), it is questionable if the results can be generalized. Moreover, since case studies of innovative founders and their firms do not provide a systematic comparison with founders of non-innovative firms, nor with people who remain in self-employment, one cannot determine the extent to which innovative founders are special or face specific problems. Answers to such questions require statistical analyses of larger data sets.

Although the perfect database for investigating all the relevant questions does not exist, there is some publicly available information that allows the investigation of some specific issues. Important data sources for longitudinal micro level analyses are the German Socio-Economic Panel (SOEP) (see Goebel et al. 2018), the British Household Panel (BHP) and the available Panel Studies of Entrepreneurial Dynamics (PSED) (see Reynolds and Curtin 2008). Other valuable sources can be found in administrative data, such as employment statistics, social insurance statistics, or tax statistics. If such information can be organized as individual panel data they may be useful in analyzing the individual career paths of innovative founders and help us better understand the emergence of innovative new firms and the reasons why founders choose certain locations to establish their businesses.

6. Concluding remarks

The emergence and location of innovative new businesses can have considerable economic effects. More knowledge about the issue may be especially important for the design of appropriate policies that aim at stimulating the commercialization of knowledge by innovative start-ups.

It is clear from our review of the available empirical evidence that macro-level analyses are largely unsuited for identifying the relevant causal relationships, especially the effect of regional characteristics on innovative start-ups. I believe that micro-level studies that investigate the career paths of potential founders, especially their spatial mobility, might be helpful in identifying causal links that will provide policymakers with the

information they need to design effective policies that will support the growth of entrepreneurial activities.

Another shortcoming of studies in the field of innovative entrepreneurship is the lack of consensus among scholars about what constitutes an innovative start-up. In a similar vein, it is not clear how to differentiate between the various types of innovative start-ups. It is, therefore, of crucial importance to know more about the merits and deficiencies of different approaches used to identify and categorize innovative new businesses.

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