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Entrepreneurship: an assessment

Colin Mayer,* Donald S. Siegel,** and Mike Wright***

Abstract: This article reviews evidence of the impact of entrepreneurship on job creation, gender and race discrimination, university spin-offs, growth, economic geography, finance and the public sector. It defines entrepreneurship, corrects some conventional wisdoms about it and discusses policy implications of the evidence on its determinants and effects. The article suggests that the distinctive nature of entrepreneurship raises theoretical, empirical and policy issues that the existing literature has not even begun to address to date.

Keywords: entrepreneurship, job creation, growth, finance, university spin-offs

JEL classification: M13

‘Opportunity is missed by most people because it is dressed in overalls and looks like work.’

Thomas Edison

‘Enthusiasm is the sparkle in your eyes, the swing in your gait, the grip of your hand and the irresistible surge of will and energy to execute your ideas.’

Henry Ford

I. Introduction

Few would deny that Thomas Edison and Henry Ford were entrepreneurs. As the founders of General Electric and the Ford Motor Company, respectively, their commercial endeavours have had profound impacts on the lives we lead and the world we live in. But while we may recognize an entrepreneur when we see one, defining an entrepreneur is notoriously difficult. The OECD defines entrepreneurship as ‘enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets’ (OECD, 2017, p. 16). The OECD measures entrepreneurship predominantly in terms of enterprise and job creation and the size of firms, and concludes that ‘in all OECD countries enterprise

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creation rates in services outpaced those for industrial firms, contributing around two-thirds of all jobs created by new firms in 2014' (OECD, 2017, summary).

While entrepreneurship is unquestionably important and there is growing interest among academics and policy-makers in studying and promoting it, economists have been slower than other social scientists (e.g. sociologists) and academics in several fields of business administration (e.g. management, strategy, and finance) to advance scholarship in entrepreneurship. Some economists have studied the impact of entrepreneurship on economic growth, both theoretically and empirically (Schmitz, 1989; Audretsch, 1995), its effects on firm growth and survival, market structure, and competition (Jovanovic, 1982; Sutton, 1997; Caves, 1998), and the role of entrepreneurship in job creation and destruction (Davis *et al.*, 1996; Haltiwanger *et al.*, 2013). Others have analysed the unique characteristics of entrepreneurs (Evans and Jovanovic, 1989; Blanchflower and Oswald, 1998; Lazear, 2004, 2005). There is also a burgeoning literature on university entrepreneurship, sometimes known as academic entrepreneurship, which arises from 'technology transfer' and the commercialization of intellectual property at universities (Siegel *et al.*, 2007; Link *et al.*, 2015).

Although these papers have added significantly to our understanding of the policy implications of entrepreneurship, there is a need for a systematic review and synthesis of research on entrepreneurship, and a consideration of new and insufficiently considered aspects of it. The purpose of this issue of the *Oxford Review of Economic Policy* is to fill this void, to identify the lessons that have been learnt to date, and to encourage further research on the policy implications of entrepreneurship.

In the remainder of this article, we explore the meaning of entrepreneurship and the theory of entrepreneurship. Next, we consider the contribution of entrepreneurship to job creation, the types of individuals involved in entrepreneurship by gender, race, and ethnicity, and the role of university education and research in promoting entrepreneurship. In the subsequent sections, we assess key policy issues and examine the relation of entrepreneurship to economic growth, externalities and market failures associated with entrepreneurship, the financing of entrepreneurship, and the role of entrepreneurship in public-sector institutions. The paper concludes with lessons learned for economics, policy, and future research.

The main messages of the article are, first, that much of the empirical literature on entrepreneurship fails to recognize its distinctive features and, instead, conflates size of organizations with forms of activity. Second, *laissez-faire* does not deliver either adequate or appropriate entrepreneurship. Third, more active public policy towards entrepreneurship is required than is conventionally considered to be the case to promote it, and to ensure that it is appropriately supported by conducive institutional, funding, and university arrangements. Fourth, insufficient attention has been devoted to whether entrepreneurship delivers socially, as well as privately beneficial outcomes, and the optimal quantity and quality of jobs.

II. What is entrepreneurship?

There is a long-standing and still unresolved debate in economics and other disciplines, such as sociology and psychology, about what entrepreneurship is and what

entrepreneurs do (see, for example, [Westhead and Wright \(2013\)](#) for discussion; [Parker, 2018](#), this issue). A major challenge for policy and researchers is assessing the extent of entrepreneurial activity and how to measure it. An issue that arises is the distinction between self-employment or small business ownership and entrepreneurship. Often, the two are treated synonymously, largely because it is easier to identify self-employed individuals and small businesses in large archival datasets. Entrepreneurial activity is then measured by metrics such as the number of start-ups, self-employment rates, and small and medium-sized enterprise (SME) activity. Many entrepreneurs are also hybrid entrepreneurs, pursuing entrepreneurial activities while employed, only switching to full-time self-employment if their ventures prove to be viable ([Folta *et al.*, 2010](#)).

These approaches omit entrepreneurship taking place in corporations or firms bought out or spun off from existing corporations. Such measures do not take account of the extent to which these forms of entrepreneurship involve Schumpeterian innovation, add to economic growth, or generate financial returns. These are critical issues for research and policy, as evidenced by a 50-country study which shows that the rate of billionaire entrepreneurs—a measure of high-impact entrepreneurship—correlates negatively with self-employment, small business ownership, and firm start-up rates ([Henrekson and Sanandaji, 2014](#)). In particular, countries with higher income, higher trust, lower taxes, more venture capital investment, and lower regulatory burdens are precisely the ones that have higher billionaire entrepreneurship rates but less self-employment. Venture survival rates are also higher when start-ups engage successfully in both product and process innovation ([Colombelli *et al.*, 2016](#)).

In addition, entrepreneurship that takes place in existing ventures may have a significant impact on innovative activity. For example, management buyouts of divisions of larger corporations or family firms may provide the discretion needed to pursue new market and product opportunities restricted by former owners ([Wright *et al.*, 2000](#)). Management buyouts yielded greater innovation ([Amess *et al.*, 2015](#)) and enhanced economic and financial returns ([Lichtenberg and Siegel, 1990](#); [Meuleman *et al.*, 2009](#)). Impactful entrepreneurship may also derive from activities with not-for-profit social objectives ([Zahra *et al.*, 2009](#)) and ventures in the informal economy ([Baumol, 1990](#)).

All of this points to the difficulty of simply using the size of firms or start-ups as measures of entrepreneurship. Although the terms innovation and entrepreneurship are often used interchangeably, they are not the same. Indeed, only a minority of ventures are innovative, in terms of providing products and services new to customers and competitors, and even fewer involve radical technologies and products ([Autio *et al.*, 2014](#)). Hence, rather than focusing on business start-ups and innovations, a more meaningful indicator of entrepreneurship is the processes involved in the identification and pursuit of opportunities. As noted by Hayek (1945), [von Mises \(1949, 1952\)](#), and [Kirzner \(1973, 1974, 1985\)](#), it is uncertainty rather than risk that is central to entrepreneurship, namely judgements that lack the information necessary to assign risk probabilities to business opportunities. In this regard, entrepreneurship involves the discovery of pre-existing opportunities or the creation of new opportunities that previously did not exist, rather than just the formation of new companies. In other words, it is Henry Ford's 'sparkle in your eyes, swing in your gait, grip of your hand and irresistible surge of will and energy to execute your ideas', rather than Thomas Edison's 'work dressed in overalls' that delineates entrepreneurship from regular enterprise. It is in that context that one should examine the contribution of entrepreneurship to economic activity ([Wood and McKinlay, 2018](#)).

This distinction between size of organization and process of identification and pursuit of opportunities is important on several scores. First, it means the activity that most empirical studies measure is not entrepreneurial in any meaningful sense of the term. In failing to identify processes characterized by uncertainty rather than risk, it conflates size and form of activity. Second, as is discussed in the next section, it has important theoretical implications for thinking about what distinguishes an entrepreneur from an enterprise creator or manager. Is the process of identification and pursuit of opportunities inherited or acquired? If the former, what are the characteristics of entrepreneurs by, for example, gender and ethnic origin? If the latter, what contributes to the acquisition of entrepreneurial skills, learning by doing and failing, or university education and research?

Third, what can public policy do about it? If entrepreneurship is characterized by uncertainty and an absence of calculable risks, are there policies that are conducive to promoting this type of activity as against more routine investments? Are there knowledge spillovers associated with radical uncertainty that create market failures and a need for public policy interventions? How can finance for entrepreneurship be promoted, and do recent innovations address market failures in the provision of entrepreneurial finance? Can public institutions themselves be entrepreneurial in the way in which they deliver public services? And does the uncertainty that characterizes entrepreneurship create particular conflicts between the private benefits and social costs of entrepreneurship?

The following sections address these issues in turn.

III. Entrepreneurship and economic theory

There is a long-standing tradition of theoretical research on entrepreneurship. According to Hébert and Link (2009), Richard Cantillon was the first scholar to consider the role of the entrepreneur. Cantillon (1931) defined the entrepreneur as an agent who engages in exchange for profit and exercises judgement in the face of uncertainty. Abbé Nicolas Baudeau (1910, originally 1767), a physiocrat, was the first economist to assert that an entrepreneur is an agent who uses knowledge and intelligence to innovate, which he hypothesized was a source of economic growth.

According to von Mises (1949, 1952), an entrepreneur is not just another factor of production alongside capital, labour, or land. An entrepreneur identifies economic and commercial opportunities that have not previously been recognized and has the capability of initiating actions to exploit those opportunities. According to Kirzner (1974), the entrepreneur's 'rights rest strictly on the vision and initiative with which, at the time he owned no productive resources, he undertook to marshal them for his purposes'. Schumpeter (1934, 1950) viewed the entrepreneur as innovator, responding to new information, engaging in product or process innovation, establishing new markets, and capturing new sources of supply. However, Hayek (1945) criticized Schumpeter for viewing entrepreneurship as a systematic discovery of objectively existing opportunities.

In this issue, Simon Parker (2018) reviews recent theoretical research on entrepreneurship, as well as more traditional theories. He notes that economic theories of

entrepreneurship emanate from three fields of economics. The first is labour economics, which focuses on occupation choice, i.e. the antecedents and consequences of the decision to become an entrepreneur. Second are the numerous microeconomic theories of entrepreneurship and innovation, building on Schumpeterian insights. Some of these consider the role of the entrepreneur in determining industry structure and competition, and relate to the field of industrial organization. Finally, some economic theories of entrepreneurship are derived from macroeconomic theories of innovation, economic growth, and business cycles.

Parker synthesizes these theoretical findings and identifies some new areas of theoretical research on entrepreneurship. These include the need for additional theoretical research on such important topics as crowd-funding, multi-sided platforms, intrapreneurship, habitual entrepreneurship through either serial and portfolio entrepreneurship, and business transfers. For example, habitual entrepreneurs raise important issues concerning whether and how entrepreneurs learn from experience. They are of particular significance given that they account for around half of private firm ownership in countries such as the UK (52 per cent), US (51–64 per cent), Finland (50 per cent), Australia (49 per cent), and Norway (47 per cent) (Westhead and Wright, 2013).

The notion of learning from experience has ignited a debate regarding whether habitual entrepreneurs who have previously failed should receive policy support for subsequent ventures. The evidence reveals a more nuanced story about learning than is conventionally suggested in the Silicon Valley context of ‘you haven’t succeeded until you’ve failed’. In particular, learning from entrepreneurial experience appears to depend on the nature and extent of prior experience. Entrepreneurs show more positive learning—that is, reassess their actions rather than blaming external factors—if previous failures were part of a portfolio of businesses they owned concurrently rather than having owned businesses sequentially (Ucbasaran *et al.*, 2009).

Entrepreneurs may also learn more positively if their prior entrepreneurial experience includes successes as well as failures (Ucbasaran *et al.*, 2010). The dominance of more experiences with failure than with success tends to encourage entrepreneurs to be less innovative in subsequent entrepreneurial activities. This suggests that a government policy focused simply on relaxing bankruptcy laws to promote entrepreneurship may not be effective unless it includes complementary support mechanisms to hone the identification and exploitation of innovative opportunities. ‘Learning by failing’ is an emerging subject of study with important policy implications.

IV. The impact of entrepreneurship on job creation

How does entrepreneurship contribute to job creation? Empirical analysis of the role of start-up firms in job creation began with research conducted by David Birch in 1987. He reported that companies with fewer than 20 employees accounted for 88 per cent of overall US employment growth over a 5-year period. Although his figures almost certainly overstated his case, the publicity surrounding their release nevertheless acted as a spur to economists to take the subject of entrepreneurship seriously.

More precise, sophisticated, and comprehensive studies were subsequently conducted by Steve Davis of the University of Chicago and John Haltiwanger of the University of Maryland, along with other economists from the Center for Economic Studies at the US Census Bureau (e.g. [Davis et al., 1996](#); [Haltiwanger et al., 2013](#)), where comprehensive plant or establishment-level data were available. These studies were notable because of their precise measures of job creation and job destruction, constructed from the best available plant and firm-level data, using sophisticated econometric methods. However, they did not distinguish between activities based on uncertainty and more conventional forms of risk taking. A key stylized fact that emerged from this series of studies was that entrepreneurial firms contribute more to both gross and net job creation than larger, older firms and, critically, younger firms are more important job creators than smaller firms.

According to [Decker et al. \(2014\)](#), start-ups account for about 20 per cent of US gross job creation, while high-growth businesses (which are disproportionately young) account for almost 50 per cent of gross job creation. However, the authors also note that start-ups fail at a higher rate than comparable firms, demonstrating that most start-ups exit within their first 10 years and that most surviving young businesses remain small in terms of employment. Thus, the net effects of start-ups on job growth are not nearly as strong as the raw data would seem to suggest.

Job creation and policies designed to promote entrepreneurship are important. Policies offering tax relief and other subsidies to small business are prevalent, reflecting a near religious belief in the entrepreneur as job creator, particularly during economic downturns and periods of high unemployment. But the number of jobs is not the same as the quality of jobs, and unfortunately empirical evidence on the quality of jobs created by entrepreneurs seems to suggest that, on average, they are of lower quality. For example, [Litwin and Phan \(2013\)](#) conducted an extensive analysis of the Kauffman Firm Survey (KFS), a comprehensive database of entrepreneurial firms. Based on an analysis of 4,928 firms, the authors found that only 31 per cent of new firms provide their fulltime workers (including founders) with any form of health insurance, while the corresponding figure for representative firms was approximately double that figure. They also reported that only 15 per cent of new firms offered their full-time workers any form of retirement or pension plan, while the corresponding figure for representative firms was approximately 50 per cent.

In this issue, [Joern Block, Christian Fisch, and Mirjam van Praag \(2018\)](#) provide an extensive literature review on the quantity and quality of jobs created by entrepreneurial firms. According to the authors, it appears that small companies have an enduring positive effect on net job creation, but, when it comes to job quality, the findings are not nearly so encouraging. The evidence suggests that entrepreneurial firms attract a different type of worker from established firms—those who are less concerned about salary and place a stronger weight than conventional employees on value creation, innovation, and the importance of challenges. For those seeking more stable, secure, supported employment, entrepreneurship has less to offer and presents potential risks of exploitation. This raises important issues regarding the quality of human capital in entrepreneurial firms, its association with growth and productivity, and the appropriate regulatory support that needs to be provided to more vulnerable members of society, not least by gender and ethnicity.

V. Entrepreneurial type: gender

There are large international differences in the proportion of businesses owned by women. However, in most countries, more men than women start businesses ([Federation of Small Businesses, 2016](#)). In the US, estimates suggest that women-owned businesses account for 39 per cent of all US firms, rising to 47 per cent if the number of businesses owned equally by men and women are included ([American Express, 2017](#)). The number of women-owned businesses has been increasing faster than the number of businesses generally. In the two decades from 1997, the number of women-owned businesses in the US rose by 114 per cent compared with 44 per cent for all businesses. However, while the share of women-owned firms rose from 26 per cent in 1997 to 39 per cent in 2017, the share of employment only grew from 7 to 8 per cent, while revenue shares declined from 4.4 to 4.2 per cent.

In 2017 in the UK, 21 per cent of businesses with no employees and 19 per cent of those SMEs with employees were majority-led by women ([BEIS, 2018](#)). As in the US, men and women together own a further substantial proportion of businesses—some 21 per cent in the UK—and self-employment by women appears to have been increasing faster than that for men since the recession ([ONS, 2015](#)).

Various factors have been considered as explanations for lower rates of entrepreneurship (measured by business ownership) and lower financial value of these businesses for women, as compared to men. These factors include marital status, children, education levels, gender discrimination in paid employment, a greater focus on businesses in service sectors with more limited access to markets, initial resource constraints on business growth, and gender discrimination in the availability of bank finance. In their review of the literature, [Carter *et al.* \(2015\)](#) suggest that there is little evidence of supply-side discrimination, but that demand-side aversion to debt-finance is more pronounced among females. This is consistent with suggestions from evidence based on newly incorporated ventures that the presence of women on boards may be more conducive to risk-averse behaviour that improves chances of venture survival rather than entrepreneurial behaviour ([Wilson *et al.*, 2014](#)).

In their paper in this issue, [Robert Sauer and Katharina Wiesemeyer \(2018\)](#) examine differences in access to finance and business value by gender, using longitudinal German panel data. Their findings are indicative of differential access to finance by gender, given that an increase in personal wealth substantially affects the probability of being a business owner only among females, and that bank loans have a greater impact on total business value in female-owned firms.

A number of initiatives by policy-makers and practitioners have been introduced to promote female entrepreneurship, including training, counselling, mentoring, and access to finance on favourable terms. Sauer and Wiesemeyer's conclusion is that more attention needs to be given to encouraging applications and business loan applications by female entrepreneurs, and in particular to changing perceptions about the barriers to accessing finance.

Another policy direction concerns the extent to which alternative sources of finance, such as crowdfunding, may be more attractive to female entrepreneurs discouraged from accessing traditional sources. However, evidence from the rewards-based platform Kickstarter suggests that while females have a higher success rate, they tend to raise

less finance, and have more success in attracting funding from other females than males (Marom *et al.*, 2016). Further, evidence from a Swedish equity crowdfunding platform shows female investors to be more likely to invest in projects with a higher proportion of male investors (Mohammadi and Shafi, 2018).

VI. Entrepreneurial type: race and ethnicity

Ethnic and racial minorities often face challenges of integration and assimilation in their host country that may persist beyond first-generation migrants. As such, they may collocate in particular cities or regions with groups with the same home-country origin, ethnic background, language, vision, and values. In this issue, the paper by Robert Fairlie (2018) shows that 27.7 per cent of business owners in the US were black, Latino, or Asian, but that these ethnic and racial groups accounted for 36.2 per cent of the total population. In the UK in 2017, 4 per cent of SME employers were minority ethnic group (MEG) led, defined as having a person from an ethnic minority in sole control of the business or having a management team with at least half of its members from an ethnic minority (BEIS, 2018).

Entrepreneurial ventures owned by ethnic and racial minorities are generally viewed as facing complex challenges relating to concentration of their activities in particular sectors and markets, accessing finance, and limited management skills that constrain their ability to grow their businesses in areas where they can have a higher value impact. They are typically viewed as becoming entrepreneurs out of necessity, serving markets based on their ethnic and racial communities, which, in turn, constrains their prospects for business growth. While there is some debate about discrimination against particular ethnic and racial groups by finance providers, evidence seems to suggest that problems in accessing finance relate more to standard risk factors concerning the businesses and sectors in which they operate rather than to direct discrimination (Carter *et al.*, 2015). Importantly, however, the evidence indicates these challenges differ across ethnic and racial groups. For example, we know that part of the reason for low take-up of external finance by entrepreneurs is because they have been discouraged from approaching fund providers either by previous rejections or by a perception that they would be turned down if they were to seek funding (Fraser *et al.*, 2015). Recent evidence suggests that this problem is particularly acute among racial minority entrepreneurs, but its severity varies across entrepreneurs from different racial backgrounds, especially for African Americans and Hispanic Americans (Neville *et al.*, 2018).

Fairlie (2018) extends the heterogeneity theme by exploring potential barriers to ethnic and racial minority business ownership and income, based on US Census household microdata. He finds that low levels of wealth contribute to why blacks and Latinos have lower business ownership rates, while high levels of wealth increase Asian business ownership rates. He also shows how differences in education influence variations in business ownership by different ethnic groups. In particular, low levels of education contribute to why blacks and Latinos have lower business income, while high levels of education increase Asian business income. Age also plays an important role with blacks, Latinos, and Asians being relatively young compared to whites, so reducing business ownership rates. These findings highlight the need to recognize the implications of the heterogeneous nature of ethnicity and race for entrepreneurship.

This evidence of heterogeneity indicates that policy to support entrepreneurship in ethnic or racial sub-groups may need to be fine-grained rather than a one-size-fits-all in order to address the different aspects of market failure that each face—for example, gender issues within and between different ethnic and racial groups.

VII. University education, research, and spin-offs

Universities are increasingly focusing on the start-up of university technology transfer, as opposed simply to securing patents and licensing them (Link *et al.*, 2015). Previous studies have demonstrated that university culture and strategy play an important role in determining the volume of start-up activity and resources devoted to their growth and development. For example, based on a qualitative analysis of five European universities that had outstanding performance in technology transfer, Clarke (1998) concluded that the existence of an entrepreneurial culture at those institutions was a critical factor in their success. Roberts (1991) finds that social norms and MIT's tacit approval of entrepreneurs were significant determinants of successful academic entrepreneurship at MIT. Lockett *et al.* (2003) reported that universities generating the most start-ups have clear, well-defined strategies regarding the formation and management of spin-offs.

As with licensing, the organization and use of resources have been shown to be important influences on the development and growth of university start-ups (Lockett and Wright, 2005). Based on evidence from 50 European universities, Clarysse *et al.* (2005) differentiate cases of where universities seek to create small numbers of start-ups that become global businesses generating significant capital gains, national level businesses yielding revenue streams, or large numbers of smaller consultancy and service businesses generating local employment. They also identify cases where university technology transfer offices either attempt to undertake commercialization activities beyond the resources they have available, or where they fail to develop the competences needed to achieve particular commercialization targets. These findings indicate a need to match universities' objectives for commercialization, and spin-offs in particular, with appropriate resources and capabilities and realistic perspectives on the types of successful spin-offs that can be created, given a particular university's science and resource base.

This suggests the importance of an 'ecosystem' for the development and growth of university start-ups. Such an ecosystem cannot be reduced to entrepreneurship courses, incubators, accelerators, and grants or business plan competitions. Instead, the ecosystem must also address institutions, namely formal laws and property rights, and informal sanctions, traditions, and codes of conduct (North, 1990; Autio *et al.*, 2014). Universities must also adapt to regarding entrepreneurship as a respected and valued activity and to being tolerant of failure. These are what Kenney and Patton (2005) refer to as 'entrepreneurial support networks', i.e. venture capitalists, lawyers, and accountants assisting entrepreneurial firm formation and growth alongside conducive cultures (Stephan and Uhlaner, 2010) and social norms (Webb *et al.*, 2009).

At present, we lack an overall framework for understanding the factors that shape an ecosystem, the role that these factors play, and what can frustrate the development of university-based start-ups (Van de Ven *et al.*, 1999). The paper by Gilles Duruflé, Thomas Hellmann, and Karen Wilson (Duruflé *et al.*, 2018, in this issue) attempts to

fill this gap. The authors identify two waves of university entrepreneurial activity. The first wave established key institutions on campus, such as incubators, accelerators, co-working hubs, and maker spaces. This resulted in the creation of what the authors refer to as ‘academic spin-offs’. A second wave resulted in the creation of what they call ‘university-based start-ups’. The authors assert that the second wave is quite different from the first. While the first wave involved faculty and related to the commercialization of intellectual property (traditional ‘technology transfer’), students (undergraduates, graduates, and post-doctorates) are driving the second wave.

The authors consider the policy implications of supporting such an entrepreneurial ecosystem and conclude that there are two types of relevant policies: (i) policies that affect members of the university, i.e. students, faculty, and university administrators, and (ii) policies that affect external parties who want to interact with the student entrepreneurs, especially investors and corporations. They identify the main types of policy interventions, and discuss their costs and benefits.

More recently, policies have been implemented to support student entrepreneurship, i.e. the creation or purchase of entrepreneurial ventures by students or recent alumni. This reflects the demands being placed on universities to demonstrate their direct and indirect societal and economic contributions. In the UK, from 2001 to 2016, the annual number of start-ups generated by alumni within 2 years of graduation where the graduate has received assistance from higher education institutes (HEIs) increased almost 12-fold to 3,890 (HEFCE, 2017). In both the UK and France, the number of start-ups per year by students and young graduates is approximately 20 times greater than the number created by university faculty (HEFCE, 2017; Wright *et al.*, 2018). Although their mean size tends to be smaller than in faculty start-ups, UK start-ups created by alumni within 2 years of graduation that received HEI assistance were estimated to employ a total of 22,592 (HEFCE, 2017). There are significant differences among universities in the propensity of students to engage in entrepreneurship (Daghbashyan and Hårsman, 2014; Larsson *et al.*, 2017). Promotion of student entrepreneurship at universities through various top-down and bottom-up policies may enhance the indirect economic contribution of universities. However, a one-size-fits-all policy on the development of student entrepreneurship may be inappropriate, given the heterogeneity of universities across different dimensions of disciplines, research intensity, international reputation, urban location, local connections, public versus private status, and country context. For example, universities with strong, world-class science, medical, and engineering, as well as computer science faculties, may be able to generate very different types of student entrepreneurship from those colleges or universities focused on the arts, humanities, and social sciences.

As another example, while many public universities in the US have a strong community outreach mission, which complements efforts to enhance academic entrepreneurship and student entrepreneurship, private universities are typically not as engaged with their communities. Further, heterogeneity within types of universities, such as Russell Group universities in the UK, with respect to their culture, international student bodies, and strategies towards entrepreneurship at university and department levels, influences the development of student entrepreneurship (Holstein *et al.*, 2018).

While initiatives are typically university based, in some cases they involve national governments. For example, the French government has introduced a national policy to foster student entrepreneurship through the creation of an Entrepreneur Student

Status for all students who have an entrepreneurial project during or just after their studies. At present, systematic evaluation of the effectiveness of these different policy approaches is lacking.

In sum, universities are critical to entrepreneurship. The formulation of clear policies by universities and governments to promote entrepreneurship among both academics and students, and the development of appropriate ecosystems of formal institutions and informal norms and cultures are key determinants of the success of national, regional, and local entrepreneurial initiatives. Further, a focus on simple measures of creation and ownership of start-ups by students and recent alumni may not provide an accurate picture of the contribution of universities to entrepreneurship. For example, such an approach omits individuals who follow an entrepreneurship course at university and then go on to engage in entrepreneurial activities in established corporations.

VIII. Entrepreneurship, economic growth, and geography

There is a great deal of interest, both intellectually and in the policy realm, in understanding the relationship between entrepreneurship and economic growth. While economists have traditionally focused on innovation as a key source of economic growth (Link and Siegel, 2007), William Baumol (2002) distinguishes between routine/systematic innovation and entrepreneurial innovation. He asserts that entrepreneurial innovation in the sense defined above in relation to indeterminate uncertainty rather than determinate risks is the more important source of improvements in economic performance than more routine innovation.

Baumol notes that the key sources of routine/systematic innovation are typically large, multinational firms (e.g. Novartis, GE, and Intel), while small, entrepreneurial firms, some emerging from universities, are the key sources of entrepreneurial innovation. Not surprisingly, many nations, regions, and states have adopted policies to induce entrepreneurial innovation, in hopes of stimulating economic growth. These include local, regional, and national initiatives to promote university-based start-ups (Grimaldi *et al.*, 2011), technology-based economic development in incubators and accelerators, and government programmes, such as the Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) programme in the US, Science Enterprise Challenge in the UK, the ‘Law on Innovation and Research to Promote the Creation of Innovative Technology Companies’ in France (Mustar and Wright, 2010), and ProTon Europe, the European Knowledge Transfer Association, created by the European Commission. There are also local, regional, and national initiatives to develop ‘clusters’ (Siegel *et al.*, 2003)

More broadly, the theoretical rationale for the importance of entrepreneurship policy stems from research on macroeconomic growth and international trade, as well as from studies of economic geography. These include ‘new growth’ theory, which emphasizes the importance of ideas, knowledge, and intellectual property as sources of economic growth (Arrow, 1962; Grossman and Helpman, 1991, 1994). The paper by David Audretsch (2018, in this issue) integrates key insights from these literatures to highlight the importance of entrepreneurship as a policy lever to enhance economic growth, particularly at the local and regional levels. One of the concepts he considers is that of

knowledge entrepreneurship, which refers to the establishment of a new firm that arises from an idea or knowledge emanating from an incumbent firm. Audretsch stresses that many of these knowledge spillovers are localized and he provides several examples of such localized knowledge spillovers. This Schumpeterian concept helps to explain why there is growing public investment in entrepreneurial innovation at the local and regional levels, which, as Audretsch suggests, is a natural outgrowth of the transition to knowledge-based economies.

An important aspect of geography and knowledge-based entrepreneurship is the extent to which some regions or localities are deficient in generating a 'sufficient' supply of entrepreneurs. Entrepreneurial geographical mobility may exacerbate this problem. Rather than starting a venture within the same locality of the firm for which they were previously employed, entrepreneurs may move from less attractive regions for entrepreneurship to more attractive ones (Wright *et al.*, 2018). As noted in Siegel (2006), many research universities located in remote regions encounter this problem when trying to grow start-ups that are launched on or near campuses. Similarly, students moving to metropolitan or urban areas to study may remain in these areas to start their venture rather than returning to their less industrialized home regions of origin (Larsson *et al.*, 2017). Below we discuss the development of regional-level policies to support the funding of entrepreneurship.

A similar notion of entrepreneurial geographical mobility relates to immigrants and refugees moving from one country to another (for a review, see Aliaga-Isla and Rialp (2013)). A reverse movement involves entrepreneurs returning from a developed economy to an emerging economy, such as China or India, transferring the knowledge gained in the former to the latter (Kenney *et al.*, 2013). Several studies show the benefits of policies designed to encourage such movement, in terms of establishing more innovative entrepreneurial ventures and yielding beneficial spillovers to local firms (Liu *et al.*, 2010; Filatotchev *et al.*, 2011). Returnees may need support or help in reactivating or creating the networks they require in their home countries to build viable ventures (Leyden *et al.*, 2014; Qin and Estrin, 2015). Individuals based in regions in developed economies with links with emerging economies can also create potential spillover benefits for entrepreneurship in both regions, such as between the former East and West Germany following the fall of the Berlin Wall (Burchardi and Hassan, 2013).

In sum, policies that are required to promote entrepreneurial rather than routine innovation, local as well as national clusters of entrepreneurship, positive spillovers, migration of entrepreneurs, and reintroduction of returning entrepreneurs may be critical to economic growth and its regional and international distribution.

IX. Entrepreneurial finance

Given that entrepreneurs typically require substantial funds to launch and sustain a venture, especially if it is high-tech, finance is critical. In the context of uncertainty associated with entrepreneurial activity, asymmetric information between entrepreneurs and funders gives rise to potential gaps between the demand and supply of finance. Asymmetries relate to both objective and subjective information. Funders may attempt to reduce asymmetries through various screening strategies, but may face

insurmountable challenges regarding subjective information about the future size of markets for products that do not yet exist. If funders do invest under such circumstances they are likely to put in place both contractual and relational measures to minimize downside risks (Hellmann and Puri, 2002).

There are several types of potential investors in start-ups (Mayer, 2002). The first is venture capital firms, which typically have a minimum size of investment thresholds (Mayer *et al.*, 2005). Another type of investor is the business angel, or an individual investing his own money into a new and growing privately owned venture. Many angel investors bring not only finance to the business but also access to business experience, strategic advice, and market and customer contacts (Fraser *et al.*, 2015). Business angels may invest as individuals but increasingly operate as a group of angels, referred to as a syndicate or network. While traditionally, business angels have been mostly highly experienced white male entrepreneurs or managers, recent evidence indicates a substantial increase in the number of women and younger angels (Wright *et al.*, 2015). Many younger angel investors have had experience as high-tech entrepreneurs, especially in information and communication technology (ICT) sectors. Angel investors also play a significant role in social entrepreneurship with approximately a quarter of angels having invested in ventures that have a social impact (Wright *et al.*, 2015).

In recent years, crowdfunding has developed into an important mechanism for attracting modest amounts of funding for entrepreneurial ventures (Bruton *et al.*, 2015). Entrepreneurs seek funding by making pitches to the network of investors who have signed up to the platform. Crowdfunding platform managers typically engage, to differing degrees, in some form of screening of offerings. Once accepted, a pitch is usually live on the platform for a fixed period. Platforms typically have an all-or-nothing approach, meaning that crowdfunders cash in the money only if the capital pledged at the closure of the campaign is at least equal to the funding goal.

There are several types of crowdfunding mechanisms. Donation crowdfunding platforms finance projects by securing small donations from a large number of donors. Reward platforms source small amounts of money from individuals in exchange for rewards. Kickstarter is one of the largest rewards-based crowdfunding platforms. Lending platforms borrow from the crowd, with individuals contributing small parts of the overall loan amount. Equity crowdfunding platforms seek investment from the crowd in exchange for a share in the entrepreneur's business or project. Global estimates indicate that in 2015, peer-to-peer lending platforms raised \$25 billion, reward and donation crowdfunding raised \$5.5 billion, and equity crowdfunding raised \$2.5 billion (Massolution, 2015). The rapid growth in crowdfunding is reflected in estimates from the UK, which suggest that the amounts raised rose by 43 per cent between 2015 and 2016 to reach £4.6 billion (Cambridge Centre for Alternative Finance, 2017). Of this total, peer to peer lending accounted for £3.55 billion (of which £1.23 billion was peer to peer business lending), equity crowdfunding was £272 million, reward based crowdfunding £48million, property crowdfunding £71million, invoice trading £452million.

In contrast to other forms of crowdfunding, equity crowdfunding investments tend to be somewhat larger, with a smaller number of investors (Nesta, 2016). Of the different forms, equity crowdfunding has grown the most rapidly in recent years and now accounts for 17 per cent of total UK seed and venture-stage equity investment and peer to peer business lending provides the equivalent of 15 per cent of all new loans lent to small businesses by UK banks (Cambridge Centre for Alternative Finance, 2017).

Individual lead investments in pitches are routinely between £100,000 and £200,000; and depending on the model that the equity crowdfunding platform follows, average investments are between £1,000 and £3,000 (Estrin and Khavul, 2016). Even so, the minimum investment of £10 remains popular with many investors.

As a rapidly diffusing sector, crowdfunding has seen significant entry of new types of providers as well as the exit of others. Different models of equity crowdfunding have emerged involving nominee (Seedrs), individual (Crowdcube), syndicated shareholdings (Syndicatoroom), and fund structure approaches. These platforms introduce different roles for individual retail investors compared with more ‘sophisticated’ angel investors and angel syndicates. Recent evidence indicates that some 45 per cent of business angels are now investing alongside crowdfunding platforms (Wright *et al.*, 2015). Business angels are themselves providing increased amounts of funding and following ventures across different stages of development as a result of the growth in syndicates of angels. With respect to exits, it is estimated that, in the UK, 35 platforms closed or merged between 2015 and 2016 and that the five largest platforms account for 64 per cent of the market (Cambridge Centre for Alternative Finance, 2017). Crowdfunding does not overcome many of the issues relating to asymmetric information and the jury is still out on its effectiveness.

While there has been some debate about the existence of a funding or equity gap, policy initiatives have tended to focus on addressing the gap for seed and start-up stage ventures requiring funding for the development of proof of concept and prototypes, the so-called ‘valley of death’ (Cumming *et al.*, 2016). The recent development of government and privately funded accelerator programmes, especially in high-tech and ICT areas, also addresses the funding and support gap for early stage ventures (Wright and Drori, 2018). However, these sources often provide little opportunity for follow-on funding needed for these firms to grow beyond start-up. This situation gives rise to the need to address a significant second equity gap involving somewhat older and larger entrepreneurial firms beyond the initial start-up revenue generation phase (Rowlands, 2009). This gap may be especially pertinent for highly innovative knowledge-based firms with complex products that take many years to generate significant revenue streams and hence generate major information asymmetries for prospective financiers (Wilson *et al.*, 2018). The total of this second equity gap for innovative knowledge-based firms in the UK has been estimated at £1.5 billion in 2013 (Wilson *et al.*, 2018).

These recent developments in the demand for and supply of entrepreneurial finance have meant changes to the traditional notion of a funding escalator that reflects the need for ventures to obtain increasing amounts of funding from different types of providers as they develop through various growth stages. The growth in types of providers at each stage of development has fundamentally changed the funding landscape as different types of providers compete with each other. Interestingly, investment syndication may also involve different types of providers rather than simply syndication between providers of the same type.

The paper by Douglas Cumming, Sofia Johan, and Yelin Zhang (2018, in this issue) assesses the public policy implications of these developments. In particular, they note that public policy towards entrepreneurial finance has traditionally paid little attention to the interaction of different forms of finance. They argue that policy needs to adopt a portfolio approach in order to play a greater role in mitigating frictions among different sources of funding in order to facilitate the scale-up of entrepreneurial ventures

from start-up to becoming successful large enterprises. In so doing, there is a need to understand which factors enhance complementarity in the portfolio of funds providers and which constrain it.

Cumming *et al.* (2018) suggest that constraining factors involve excessive ownership dilution in one form of funding that creates problems in accessing a follow-on source of funding, and conflicting advice to entrepreneurs based on the interests of different funding sources. Factors enhancing complementarity concern effective signalling by entrepreneurs that reduces information asymmetries for investors and the lowering of barriers of institutional, geographical, and cultural distance for entrepreneurs to grow their businesses.

Another policy issue relating to entrepreneurial finance concerns the spatial nature of any equity gap. Studies have debated whether such a gap may arise as both funders and investees may be regionally or locally clustered (Fritsch and Schilder, 2007). This gap appears to vary across regions (Martin *et al.*, 2005; Mason and Pierrakis, 2011). Babcock-Lumish (2009) identified a spatial mismatch between investors and investees in the UK, with a thriving formal venture capital and informal business angel funder cluster in London, but innovative firms (i.e. deals) scattered throughout the country. In the case of venture capital investment in spin-outs from universities, Mueller *et al.* (2012) show that in cases located outside the so-called 'golden triangle' of London, Oxford, and Cambridge, cross-regional venture capital investment could be attracted where entrepreneurs had prior entrepreneurial experience. Furthermore, a significant percentage of business angels do invest across regions, not just in their local region (Harrison *et al.*, 2010; Wright *et al.*, 2015). In the UK, recent attempts to redress the north/south divide have gained impetus through the so-called 'Northern Powerhouse' which, articulated in a number of policy statements and reports, has the ambitious aim 'to transform Northern growth, rebalance the country's economy and establish the North as a global powerhouse' (Lee, 2016). A major element of the Northern Powerhouse policy focus concerns the provision of finance to enable existing private companies to realize growth opportunities. The inadequate provision of funding to firms with growth potential provides a rationale for government intervention in venture financing.

In sum, while there has been an explosion in alternative sources of start-up financing through web-based platforms, there remain significant deficiencies in the availability of funding for scale-up as against start-up, in the provision of funding that assists companies through successive stages of their development, and in the regional distribution of funds. As noted above, funding also plays an important role in addressing gender and ethnic imbalances in entrepreneurship.

X. Public-sector entrepreneurship

Entrepreneurship is not restricted to the private sector. In recent years, there has been a substantial rise in entrepreneurial initiatives in the public sector. These initiatives involve federal agencies, universities, and state and local governments aiming at broader economic and social goals than conventional forms of entrepreneurship focused on profit maximization at the firm level. Such broader goals include the more rapid commercialization and use of inventions and new technologies arising from government-funded

research, enhancement of regional economic development, and sustainability and environmental objectives.

Public-sector entrepreneurship therefore complements the private sector in areas where the private sector cannot be expected to internalize externalities or address market failures. There is a plethora of public policies and programmes to promote technology transfer and entrepreneurship at universities and federal/national labs, and, more generally, the commercialization of federally funded research (e.g. the Bayh–Dole Act (Grimaldi *et al.*, 2011), the Stevenson–Wydler Act (Link *et al.*, 2011), the Small Business Innovation Research Program (Audretsch *et al.*, 2002; Siegel and Wessner, 2012), and the NSF I-Corps Program (Pellicane and Blaho, 2015)).

Public-sector entrepreneurship is an emergent area of research in political science and public administration (Lewis, 1980; Schneider and Teske, 1992; McGinnis and Ostrom, 2012). The paper by Christopher Hayter, Al Link, and John Scott (2018, in this issue) provides a definition of public-sector entrepreneurship. The authors assert that public-sector entrepreneurship consists of (i) innovative actions; (ii) actions that change the social and economic environment; and (iii) actions that are characterized by uncertainty. They summarize the literature on public-sector entrepreneurship, provide illustrations of public-sector initiatives, discuss the changing nature of public-sector entrepreneurship, identify new areas where this concept is applicable, and make policy recommendations for stimulating additional activity.

XI. Conclusions and implications

This issue dispels some conventional myths about entrepreneurship—that it is unequivocally beneficial, that it simply requires the adoption of *laissez-faire* economics for it to flourish, and that recent advances have addressed gender and ethnic gaps in entrepreneurial financing. Entrepreneurship may well lead to job creation, but the quality of those jobs may be low. Entrepreneurship can also result in greater inequality, in terms of wealth, geography (both within as well as across countries), and by gender and ethnic group.

Based on the article by Block *et al.* (2018), we can conclude that small, entrepreneurial firms constitute an engine of job creation. However, the jury is still out on the quality of these jobs. A key finding is that entrepreneurial firms may attract a different type of worker than established firms: an employee who is less focused on salary/benefits and more concerned with ‘social responsibility’, innovation, and the importance of challenges. Researchers need to explore this issue in greater depth, both quantitatively and qualitatively.

Several papers in the issue focus on the role of universities in entrepreneurial and regional development and the importance of demographic factors (e.g. race and gender) in entrepreneurship. As shown in the papers by Audretsch (2018) and Duruflé *et al.* (2018), there is no doubt that universities and regions have developed entrepreneurial ecosystems and formulated policies to promote firm development and regional economic growth. In this context, we hypothesize that one key policy issue that needs further exploration, in terms of its effects on innovation and entrepreneurship (especially for high-tech entrepreneurial firms), is the role of immigration and labour mobility.

Of course, this is a timely issue, given recent controversies surrounding the need to reform immigration laws in the US and Europe.

There has been surprisingly little research on the role of immigration in stimulating academic entrepreneurship. An exception is a study by Jennifer Hunt (2011), who found that immigrants who entered the US on temporary work visas or on student/trainee visas outperform domestic college graduates in terms of patenting, commercializing, and licensing patents. Krabel *et al.* (2012) found that foreign-born scientists at the Max Planck Institutes in Germany (research institutions in a variety of scientific fields) were more likely than their domestic counterparts to start a company. We need more theoretical and empirical studies on this topic. Such studies would also have implications relating to race, ethnicity, and gender.

The paper by Cumming *et al.* (2018) reveals that a fundamental change in the funding landscape for entrepreneurial ventures has arisen in recent years. This is shown in the increase in types of providers of entrepreneurial finance, notably with the entry of new crowdfunding platforms and syndications between different types of finance providers, raising important policy issues concerning the nature of entrepreneurial finance gaps, in general, and spatial gaps, in particular. Additional studies are needed to examine the extent of complementarities and substitutabilities among these different funding sources and the implications for policies to address funding gaps. Given the heterogeneous nature of entrepreneurship that emerges from the papers in this issue, fine-grained studies should relate the implications of these demand-side factors to supply-side finance provision. Results of such studies may help identify whether policy interventions are required to emphasize demand- or supply-side initiatives.

In sum, the papers in this issue shed important light on several aspects of entrepreneurship, including the effects of entrepreneurship on economic growth, both theoretically and empirically, its effects on job creation and destruction, academic entrepreneurship, entrepreneurial finance, and relationships between race, class, gender, and entrepreneurial activity. The papers demonstrate that the promotion of entrepreneurship requires much more than simple policies of regulation, taxes, and subsidies, and involves the building of complex ecosystems of supportive formal institutions and conducive informal cultures and social norms, as Silicon Valley, in particular, exemplifies.

It is important to note that the literature does not really address what the definition of entrepreneurship suggests is its really distinctive feature: the creation of new enterprises or the creation of entrepreneurial activities in existing enterprises that generate indeterminate uncertainty. Since many, if not most, empirical studies do not measure entrepreneurship in this sense, it is difficult to attribute the phenomena that they describe to entrepreneurship, as against more conventional enterprise creation and development. While databases of self-employment and small firms or surveys of start-up intentions have been used to generate policy prescriptions, we would argue that there is an important need to consider the design of new databases that capture a more meaningful definition of entrepreneurship and enable a more fine-grained identification of the individuals (and teams) engaged in entrepreneurial activity.

However, there is a still more serious policy implication of this failure to define entrepreneurship sufficiently precisely, namely in terms of the consequences of these indeterminate outcomes not just for private commercial returns but also in terms of societal consequences. Henry Ford could not determine probabilities associated with the likelihood of the success of the production of the Model T, or, even less, the likely market or

profits it would create. But he could also have had no conception of the social impact of the car replacing the horse-drawn vehicle on our modes of life, risks of fatalities, urban development, rural communities, landscape, environment, and climatic changes. Nor could Thomas Edison have established the probabilities of success associated with the commercialization of electricity and electricity products, but even less the social, political, and environmental consequences of their emergence.

This reflects the ‘general purpose technology’ (GPT) nature of what Edison and Ford created, namely electricity and mass production, which, as [Bresnahan and Trajtenberg \(1995\)](#) describe are (i) pervasive and used in the production of goods and services in many sectors of the economy, (ii) continually improve over time to the benefit of their users, and (iii) facilitate innovation. GPTs therefore have broad applications and productivity-enhancing effects in numerous downstream sectors and induce dramatic economic, social, and environmental changes.

And we are still to determine the impact of the likes of Sergei Brin, Larry Page, Bill Gates, Steve Jobs, Mark Zuckerberg, and Reid Hoffman, not just on their and their investors’ wealth, but, more significantly, on the lives of their users and societies around the world. These entrepreneurs also played an important role in the evolution of another GPT, computers and the internet ([Lipsey et al., 2005](#)). In other words, we have not established a satisfactory framework, let alone means for measuring and accounting for the social impact of entrepreneurship.

This association of entrepreneurship with unquantifiable uncertainty rather than determinate risk is of profound social significance. It suggests that, as Hayek, von Mises, and Kirzner argue, entrepreneurship cannot be managed without the risk of replacing market failures with still worse government failures. However, it equally raises doubts about a *laissez-faire* prescription. Since entrepreneurship has not yet even been correctly measured, we are nowhere near being able to undertake cost–benefit analyses of alternative paradigms, let alone defining policies for the governance, ownership, laws, and regulation of entrepreneurship.

Without clarity about the private and social purposes of entrepreneurship and ways of measuring the fulfilment or failure to deliver both of them, the Hayek, von Mises, and Kirzner confidence in markets to guide socially beneficial outcomes is simply misplaced ([Mayer, 2018](#)). We have experienced too many of the damaging and disastrous consequences, as well as the remarkable benefits of entrepreneurship, to have confidence that blind faith in markets alone will ensure that entrepreneurship promotes the greater good.

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