Internationalisation and localisation: foreign venture capital investments in the United Kingdom

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Abstract

Venture capital plays a significant role in economic development through the emergence of new firms, technologies, industries and markets. This role, however, is associated with systemic uneven development regionally as both the supply of venture capital and the investment in new and growing ventures is highly concentrated regionally in the core economic regions of a country. Over the past decade this intra-national regional concentration has been accompanied by an increasing internationalisation of the VC industry as cross-border investment becomes more significant. In this paper we explore the implications of this internationalisation for regional economic development in the UK. We conclude that the geography of venture capital in the UK has been shaped since the turn of the century by a significant increase in venture capital investments made by foreign funds, mainly in the form of co-investments with local funds. These foreign venture capital investments are primarily concentrated in London, Southeast England and East of England which collectively attracted 82.5 percent of all foreign VC investments made to UK companies in 2017, strongly reinforcing the existing spatial concentration of VC investment. The paper concludes by questioning whether this increased dependency of these regions on foreign venture capital matters to regional development, and draws out some of the implications for public policy.

Keywords: *Foreign Venture Capital, Cross-border investment, Internationalisation, Regional Development*

JEL: G24, P48, R11, R12

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1. Introduction

Notwithstanding the potential contribution to the growth trajectories of countries, regions and firms (Belitski et al. 2019; Breuer and Pinkwart 2018; Ernst et al. 2013), and to regional transformation in particular (Ferreira et al. 2018), the spatial aspects of entrepreneurship have until recently received little attention (Mack and Qian 2016; Plummer and Pe'er 2010; Nijkamp 2003; Wang 2012; 2013). Although the socio-spatial relations of economic actors, including entrepreneurial actors, are bound up with wider processes of economic change across a range of geographies (Yeung 2005), the 'region' is increasingly viewed in relational economic geography as a key level at which the development capacity of an economy is shaped and economic processes are coordinated and governed (Asheim 2006; Audretsch et al. 2012; Fritsch and Storey 2014). Contrary to predictions that the 'region' would disappear as a meaningful unit of analysis in the wake of globalization, the obsession of policymakers to create the next Silicon Valley reveals 'the increased importance of geographical proximity and regional agglomerations' (Audretsch et al. 2011, 11): the region has become a fundamental basis of economic and social life (Fischer and Nijkamp 2019, 198). Entrepreneurship is increasingly seen as a socio-spatial embedded activity (Mack and Qian 2016; Steyaert and Katz 2004) which does not take place

> in a wonderland of no spatial dimensions, but is deeply rooted in supporting geographic locational support conditions (such as favourable urban incubation systems, venture capital support conditions, accessibility and openness of urban systems, diversity and stress conditions in the urban environment, heterogeneous and highly skilled labour force, communication and information infrastructures, collective learning mechanisms, etc.) (Fischer and Nijkamp 2019, 206).

In this paper, we contribute to this growing interest in the geography of entrepreneurship by examining the spatiality across regions and the devolved administrations of recent

developments in the venture capital (VC) market in the UK. As such, we address the relative underdevelopment of analyses of VC in economic geography and the neglect of questions concerning the role of finance in local and regional development (Wray et al 2011). Traditionally, VC has been understood as a local phenomenon, embedded in formal and informal networks that provide information on and access to potential investment opportunities, support monitoring and value-adding activities, mitigate information asymmetries and support superior performance (Devigne et al. 2018; Sorensen and Stuart 2001; Mäkalä and Maula 2006; Cumming and Dai 2010). However, VC, in terms of both the supply of capital (funds under management) and demand for investment (funds invested in portfolio companies), is highly concentrated in core economic regions (Martin 1999; Mason and Harrison 1992; Corpataux et al. 2017). Indeed, these financial centres are 'closer' to each other in social, institutional and cognitive distance than they are to other parts of their respective national economies (Amin and Thrift 1992; Bathelt et al. 2004; Boschma 2005; Torre and Rallet 2008; Taylor and Derudder 2015; Van Meeteren and Bassens 2016; Wójcik et al. 2018). Money flows over space as well as over time, and the spatial reach of the circuits of capital has expanded, becoming increasingly global (Hudson 2011). As these global circuits of capital become more prominent they are associated with two further trends with implications for the availability and impact of VC investment across the space economy.

First, running alongside this intra-national concentration of VC has been a counter-trend in the spatiality of the industry, the internationalisation of VC (Devigne et al. 2018) as foreign investors are attracted by new opportunities and markets to invest outside their home country (Alhor et al. 2008; Bradley et al. 2019). Defined as VC investment from investors located in a country other than that where the portfolio company is located, cross-border VC has grown over the years to form a non-trivial part of the market (Tykvová 2018). International VC is a distinctive part of the market: relative to domestic VC, cross-border VC investments are larger, perform better, are associated with later stages and realize faster and larger exits (often on foreign exchanges) (Tykvová 2018; Devigne et al. 2018; Bradley et al. 2019).

Second, the extreme regional concentration of the VC market, reflected in the UK in a large discrepancy between the dominance of London and South East England (which accounts for 65% of VC and private equity funding in the UK in 2018 – BVCA 2019) and the rest of the UK, in terms of both the volume and value of VC investments (Mason and Harrison 1999; Mason 2007), appears structural not transitory. This has prompted a series of government interventions to address the 'equity gap' both nationally and in the regions: in addition to the

regional equity gap, the evolution of the institutional venture capital has been associated nationally with both a move away from seed and early stage investment and away from smaller scale investments (Mason and Harrison 1995; Murray 2007). Regionally, for example, the Regional Venture Capital Funds (RVCF) initiative launched in the UK in 2002 was designed to counteract the concentration of VC funds in London and address the lower rates of firm startup and growth in peripheral regions by increasing the supply of VC and having those funds managed by managers assumed to have local knowledge and expertise (Wray et al. 2011; Mason and Harrison 2003). More recent initiatives, such as the Northern Powerhouse and Midlands Engine, which together leverage around £650 million in funding from the European Regional Development Fund and European Investment Bank, alongside that available from regional coalitions of Local Enterprise Partnerships, for debt and equity investment to support regional SME growth, are characterised by incremental moves towards the decentralisation and localisation of funding and financing to support a rebalancing of the economy (Wray 2015; McCarthy 2018). These regional-level initiatives are complemented by additional national and London/South East regional initiatives, such as a range of Co-Investment Funds, designed to address other aspects of the 'equity gap' in the UK (Owen and Mason 2016). One consequence of these developments is that there is a high level of relative and absolute dependency on publicly backed funds outside London and the South East (Nightingale et al. 2009; Mason and Pierrakis 2013): these have emerged to compensate for the relative absence of private sector VC in the regions. However, these funds are widely associated with poorer results than independent VC investors, in terms of supporting innovation, productivity, efficiency and exit performance in their portfolio companies (Pierrakis and Saridakis 2017; Tykvová 2018; Cumming et al. 2017; Munari and Toschi 2015).

These stylised facts about a rapidly internationalising industry dominated by global circuits of capital, linking a network of global cities and the structural concentration of activity within countries are widely held as part of a wider articulation of global cities as loci for the instrumentalization of a hegemonic agenda of economic growth (Molotch 1976), driven by the integration of advanced producer services firms into global (urban) networks of capital, goods, knowledge and people (Sassen 1995; 2001; Beaverstock 1996; Derudder et al. 2010). There are, however, counter-arguments to this stylization to the effect that this concentration on advanced produced services may obfuscate economic activity driven by entrepreneurs operating outside 'mainstream capitalism' (Massey 2007; Robinson 2002). Specifically, we see this manifest in an emerging counter-narrative signalled by the growing significance of

international VC investment outside the core economic region of the host country. To date, this has not been the subject of systematic discussion and investigation.

Our contribution in this paper, therefore, is to address a gap in the regional studies and venture capital literatures – the analysis of the regional distribution and implications of foreign venture capital (FVC). Specifically, we investigate the investment activity of foreign VC funds in the United Kingdom, paying particular attention to the volume of such activity at the regional level. Our core research question can be articulated as follows: to what extent does FVC increase the uneven access to growth capital in the UK and in so doing reinforce the negative consequences of spatiality by exacerbating existing regional inequalities in the supply of VC? We address this by answering three subsidiary questions. First, is the regional concentration of domestic VC investments also reflected in that of FVC investments? Second, what mechanisms are associated with UK regional FVC? Finally, what are the implications of this increased level of dependency on foreign venture capital for regional development?

To address these questions we examine the volume and investment patterns (e.g. stage and syndication mode) of FVC investments in the UK regions. Overall, the findings of this study suggest that there is a large regional variation in the distribution of FVC in the UK: on the demand side, while around half of London, East of England and Southeast England based companies raising VC attract foreign investors, only a small proportion of companies based in Northern regions and the Midlands do so. In other words, FVC appears to reinforce the existing geography of venture capital, accentuate the 'global city' dimension of international flows of VC, and in so doing exacerbate the pattern of uneven regional economic development associated with national VC investment. This is consistent with the findings of other research that points to the important role of domestic venture capital funds: the presence of a local VC investor with whom to partner in a syndicate plays an important role in addressing the liabilities of foreignness by taking on certain responsibilities that may be easier to manage from a domestic position (Mäkelä and Maula 2005; Maula and Mäkelä 2003). However, this is not the full story: there are also a relatively large number of standalone FVC investments (i.e. investments made without a domestic co-investor). These are concentrated in those non-core regions which have weak domestic private sector VC activity, and suggests that FVC can potentially play a catalysing market development role over time in creating more active domestic VC markets (Bradley et al. 2019). Subject to a detailed appraisal of the performance of such FVC (Devigne et al. 2018) this raises the possibility that at least in part some modes of

FVC have the potential to mitigate the uneven development effects of the increasingly concentrated domestic VC industry (Kovner and Lerner 2015).

However, there is a significant caveat to this redistributive argument: not all consequences of FVC are positive: there is some evidence that foreign investors often require that companies relocate to the fund's country of origin either at the early stage of funding or during the scale up period (Mäkelä and Maula 2005), as often relocations yield higher returns relative to staying in their country of origin (Cumming et al. 2009). This has significant and negative implications to the host region as it results in brain drain and loss of employment. However, how much relocation of portfolio companies to their investors' country of origin actually happens, is largely a function of how strong the domestic ecosystem is, and these negative consequences are more likely to be observed where the domestic VC ecosystem is weak and FVC investments are made without local syndicate partners (Bradley et al. 2019).

The remainder of the paper is structured as follows. Section 2 reviews the literature on FVC investments and discusses the role of agency theory and social capital theory in VC markets. Section 3 describes the research methodology and data used in the study. Section 4 presents the research findings on the regional distribution and impact of FVC in the UK. Finally, section 5 discusses the key findings of the research and their potential implications for regional economic development and policy in the UK.

2. Literature review

2.1 The venture capital industry

Venture capital (VC) – which we define as independently managed, dedicated pools of capital that focus on equity and equity-linked investments in privately-held, high growth potential companies (Lerner 2009) - plays a critical role in technological innovation and economic development (Florida and Kenney 1988). VC firms are financial market intermediaries providing capital to companies that would otherwise face difficulties in raising investment, due to the high levels of uncertainty and information asymmetries they pose (Devigne et al. 2018; Amit et al. 1998; Gompers and Lerner 2001). Venture capital investment is typically characterised according to the stage of development of the investee company : seed investment

takes the company from idea to key first steps such as product development or market research; series A focuses on developing the business model and generating revenues; series B is funding for expansion and scaling of the business on the basis of established product/market fit; series C is funding for growth through exploitation of new markets, internationalisation, acquisition of other companies and new product development, and to prepare the business for listing/sale; series D is funding for new expansion opportunities or to address the failure to meet the targets and expectations of the series C funding round; series E is funding required to address a failure to meet market expectations, to allow the business to remain privately-held for longer or to provide more time to prepare for listing/sale. 'Classic' VC (Bygrave and Timmons 1992), in particular, is associated with investment in high growth potential small, young companies, typically cash-flow constrained, operating in or creating new markets, where the VC investor takes a (minority) equity stake in the business, and becomes involved in the monitoring and strategic development of the investee company with a view to realising a capital gain from an exit some 3-8 years after making the investment (Drover et al. 2017; Manigart and Wright 2013; Landström and Mason 2012). Although often discussed together, VC, which is the focus of this paper, is not the same as private equity: while both involve investment by financial institutions in privately held unquoted businesses, their investment focus is very different. Private equity is capital invested in existing mature companies, in large transactions (of $100m and above), for 100% of the ownership of the business, with a view to rationalising, restructuring and re-selling or listing the company to generate a return. VC is the funding of startup and young companies with significant growth potential, in smaller transactions (typically under $50m) and involving taking a minority share of the equity in the investee company, with a view to generating a capital gain from selling the company to a trade buyer (acquisition) or listing on a public market. Given the importance of VC to economic development, there has been long-standing interest from public policy makers in identifying and implementing measures to support the development of the industry across a wide range of jurisdictions (Cumming 2011; Murray 2007; Lerner 2010; Brander et al. 2015).

2.2 Foreign venture capital investments

A number of studies have noted the relative importance of FVC and its potential role in adding value to private enterprises and contributing to the local development of the entrepreneurial finance market in the receiving countries (see reviews by Devigne et al. 2018; Bradley et al. 2019). While the scale of international VC fund-raising and investment activity has been

increasing, this is not a new phenomenon. For example, over one third of VC-backed companies received investment from VCs not located in the same country (Schertler and Tykvová 2011; 2012); between 15% and 25% of US VC deals annually involve some cross-border investment (Aizenman and Kendall 2012); and 33% of VC investment in the EU in 2012 was non-domestic (EVCA 2013), rising to 46% in 2017 (EVCA 2018). In the UK in 2018 international flows of VC and private equity (PE) exceeded domestic investment: £7.44bn (£567m VC only) was invested by UK PE in UK portfolio companies; £6.05bn (£297m VC) overseas PE was invested in UK portfolio companies and £2.34bn (£59m VC) was invested by UK PE in portfolio companies overseas (BVCA 2019). At the fundraising level, Wright et al. (2005) revealed that since 1988, inflow of VC investment in Europe from foreign sources has increased from 20 percent to 47.6 percent of funds raised in 2000. Lerner et al. (2011) showed that around half of European and one third of US based funds invest abroad. US VC investment in Europe now represents 26% of total European funding (2017), up from 17% in 2013 (Bradley et al. 2019). Within Europe the UK is particularly characterised by cross-border VC investing, both as a source country and as a host country: the UK invests more capital outside the UK than does any other country, and about 50% of VC investment in the UK is foreign (31% from US investors and 22% from other foreign, mainly European, investors). Much of this cross-border inward VC investment is to fill the so-called scale-up gap (Aernoudt 2017) that prevents ventures from realising their full potential: for example, only 25% of total VC invested in series E rounds came from UK investors (Hellmann et al. 2016).

Various scholars have previously investigated the reasons VC funds invest outside their national boundaries (Devigne et al. 2018). For example, Schertler and Tykvova (2011) argue that VC funds often invest abroad for the purpose of exploiting differences in risk-adjusted expected returns between their home country and the portfolio companies' country, with deal flow considerations and value-adding activities as additional reasons. Similarly, Guler and Guillen (2004) suggest that rather than environmental uncertainty, the decision to invest internationally is driven by the availability of innovative investment opportunities and ideas that are perceived to offer the opportunity to earn superior returns. Devigne and Manigart (2013) indicate that VC firms intensively seek investment opportunities outside their national location, due to increased competition within the industry.

This increased foreign VC investment activity has direct implications for both the enterprise receiving foreign investment and the locality in which the enterprise is based. On one hand, international investors can add value to private entrepreneurial firms through increased access

to capital, knowledge and experience in foreign deals, and access to international networks and markets (Tykvova and Schertler 2014). FVC funds can play the role of information agents through which they certify the quality of their portfolio companies in home markets (Fried and Hisrich 1994), help lower the barrier of going public and reduces the liability of foreignness (Zaheer and Masakowski 1997), and provide portfolio companies with specific resources such as international knowledge, networks, and reputation that could help the portfolio companies to grow and develop internationally (Mäkelä and Maula 2006; Devigne and Manigart 2013). Furthermore, FVC is associated with widening the pool of investors involved in a deal, thereby reducing the concentration of investors (Park et al 2019).

On the other hand, capital inflow from FVC funds may compensate for the shortage of local VC supply (Schertler and Tykvova 2011) and stimulate domestic markets through the creation of exit opportunities in a foreign market (Mäkelä and Maula 2005). According to Schertler and Tykvova (2011), countries with higher expected economic growth stimulate VC investments from foreign VC funds as well as local VC funds although foreign VC funds are more likely to participate in larger deals. Aizenman and Kendall (2012) in their study on the internationalisation of VC, discovered that the presence of high end human capital, better business environment, high level of military expenditure, and deeper financial markets are important local factors that attract FVC investments.

The impact of FVC investments in portfolio companies has also received attention by scholars. Although the overall evidence is somewhat ambivalent (Devigne et al. 2018), there are indications that at least some forms of FVC, involving syndication and coinvestment with domestic VCs, are associated with better performance. For example, Devigne and Manigart (2013) discovered that companies backed by FVC funds experience accelerated sales growth after few years of operation compared to companies backed by local VC funds, but did not do so in the short-run. Cumming et al. (2016) suggest that the presence of a foreign VC in a private firm decreases their likelihood of being unsuccessful and increases their likelihood of exiting via IPO (Initial Public Offering) with higher proceeds, particularly where institutional and cultural barriers between the foreign and domestic locations are low (Li et al. 2014; Chahine et al. 2019; Espenlaub et al. 2015; Bertoni and Groh 2014), and Mäkelä and Maula (2005; 2006) point to legitimation benefits of FVC for the portfolio company in internationalising. Overall, the existing literature on FVC investments supports their positive role in companies' growth and by extension to their impact on the local environment in which they operate.

Much of the research to date on FVC has concentrated on two issues. First, research aimed at uncovering the motives for and drivers of internationalisation at the country and VC firm level, has addressed the liability of foreignness issue (the role of geographical, cultural and institutional distance in sourcing, funding, syndicating and monitoring portfolio companies). Second, a further stream of research has reviewed the performance and outcomes of international VC investments relative to domestic VC (Schertler and Tykvova 2012; Devigne et al. 2018). However, despite the significant increase in FVC research, there has been little or no attention given to the implications of increased internationalisation for the intranational uneven spatial distribution of the VC industry. Given the increasingly prominent role of foreign VC investors and the concentration and centralisation of investment decision making this represents, with consequences for the short circuiting of the traditional hierarchies of local, national and international governance (Corpataux et al. 2017), it is important to investigate the volume and investment patterns of FVC investments in the UK market and its implications for regional development.

2.3 Venture capital and regional economic development

Venture capital has an important role to play in local and regional development (Wray et al 2011): it contributes to local firm formation and growth and supports entrepreneurship; by funding new ideas and helping prove concepts it underpins innovative knowledge economies and supports the development of local technological infrastructure; and it can add to a locality's institutional thickness as a catalyst for local and regional development. However, VC investments are unevenly distributed across regions both in terms of the location of firm/resources and flow of investment (Florida and Kenney 1988). In terms of the geography of money, and of venture capital investment in particular, this points to "an ineluctable 'lumpiness' in the spaces of money … relational dependencies, hierarchies and asymmetries typify monetary spaces" (Martin and Pollard 2017, 24). This lumpiness in the operation of financial systems, institutions and markets, including VC, both reflects and contributes to the geography of socioeconomic development, the tendency of capitalism to develop unevenly across space (Cooke et al. 2011; Harvey 2006). Geography, the distribution of VC over space, is constitutive and not merely expressive: certainly, VC is located and 'happens somewhere', and that has implications for economic development both for that somewhere and, differentially, for 'elsewhere'. However, spatiality goes beyond this: VC, as part of the wider financial system, in its institutionalisation and in the ways in which it deconstructs, reassembles and distributes assets, liabilities and risk is intimately tied to the conception of space itself

(Martin and Pollard 2017, 1). The availability of and access to investment capital is crucial to the new and growing firm development process, and the allocation of funds is a key influence on economic development and economic growth to such an extent that the geography of VC (the spatial organisation of the industry and its practices by which funds are allocated over space) and the geography of economic development (the spatialities of investment, disinvestment and innovation) are fundamentally intertwined. The challenge is simple: regional development, whether indigenously motivated bottom up or policy driven top down in emphasis, requires access to finance for investment, and the availability, or otherwise, of that finance in turn shapes the nature of that regional development.

In the specific context of the UK, VC investments are not evenly distributed across regions (Mason 2007), and the uneven geography of VC investments is a reflection of the uneven geography of entrepreneurial activities that could potentially constrain the growth of companies in particular locations (Mason and Pierrakis 2013). Moreover, this concentration is more pronounced for early stage VC investments: the London region attracted more than half of the total early stage investments and together London and the South-East regions have consistently attracted a disproportionate amount of investments (Martin 1989; Mason and Harrison 1999; 2002). According to Mason (2007), less attention has been given to the regional gap in the supply of VC investments, while Martin (1989) also indicated that the regional imbalance in the supply of VC in the UK would take some time before it is redressed. Other than in the US (Leinbach and Amrhein 1987; Florida and Smith 1993; Chen et al. 2010; Florida and Mellander 2017), the 'geography of venture capital in other countries has not been the focus for research. Given the impact that venture capital has on uneven urban and regional economic development through its role in financing innovative businesses to scale, this is an important omission' (Harrison and Mason 2019, 7-8).

3. Methodology and Data Sources

This study uses data from the Thomson One database for the 15 year period between 2002 and 2017. Thomson One (previously VentureXpert) is one of the largest and most widely used VC deals database used for accessing information, market data and financial data on VC backed companies (Schertler and Tykvova 2011; Wang and Wang 2012; Espenlaub et al. 2014; Cumming et al. 2016; Colombo and Murtinu 2017). The main challenge when undertaking research on venture capital is the availability of suitable data (Hellman and Puri 2002;

McKenzie and Janeway 2008). Although no data source offers complete coverage of all venture investments, Kaplan and Lerner (2017) note that Thomson One has better coverage than the primary alternatives at the level of individual investment rounds. Kaplan et al. (2002) found that Thomson One excludes roughly 15% of the financing rounds but exhibits no significant bias. The Thomson One database contains detailed information about the dates of venture financing rounds, the investors, and portfolio companies involved, and the amounts invested to each company. The database also contains detailed information on the location of each VC firm and portfolio company (Bernstein et al., 2016). It includes the entire spectrum of private equity firms, from early stage venture investors (including public sector funds) to those engaged in leveraged buyouts (LBOs). We restrict our analysis to firms involved in venture capital investing and we limit the sample to funds classified as venture capital, and to investments in the four investment stages related to venture capital (seed, early, expansion, and later).

We manually distinguished between deals made by local VCs and deals made by international VCs. We follow recent usage (Bradley et al. 2019; Devigne et al. 2018) and define FVC funds as VC funds that are resident outside the UK but invest in UK domiciled companies. This allows us to identify three types of VC investments in UK based portfolio companies: 1) *Deals without FVC investments*: Deals involving solely domestic (UK-based) VC funds. 2) *FVC co-investments with local VCs*: A co-investment or syndicated deal between domestic investors and one or more foreign VC investors. 3) *Standalone FVC investments*: Investments in UK portfolio companies made solely by one or more foreign VC funds without the participation of a UK based VC fund. The dataset includes information on 5,932 deals made to 3,279 companie*s* in the UK and includes all VC deals made to companies in the 9 English regions and the three UK devolved administrations) (Table 1).

Insert Table 1 here

4. Findings

4.1 FVC investments in the UK

Our analysis reveals that FVC investments have become considerably more important, in both absolute and relative terms, in the supply of venture capital in the UK since the turn of the century. Specifically, the number of deals involving FVC funds, either investing on their own or co-investing with local funds, has almost doubled between 2002 and 2017. In proportional terms, there has been an even larger increase in the share of investments involving FVC funds

from 32 percent in 2002 to 58 percent in 2017 (Figure 1). FVC funds, either investing alone or together with local VC funds, are now involved in the majority of investments in the UK VC market.

Insert Figure 1 here

Interestingly, the number of standalone FVC investment has not changed significantly during the same period, consistently accounting for between 12% and 20% of all VC deals, and the increased importance of FVC investments in the UK VC market is due to the substantial increase of co-investments between foreign and domestic VC funds. This is now the dominant way in which FVC funds invest in the UK VC market: co-investments between foreign and local VC funds accounted for 42 percent of investments in 2017 compared to just 18 percent in 2002 (Figure 1).

These trends can be unpacked in two further aspects. First, looking at the time period 2002-2017 as a whole, FVC investments are proportionally more prominent in later stages of investment (Figure 2) and while in round 1, FVC funds are involved in less than 30 percent of all investments, in later rounds they become significantly more prominent, rising to 50% or more in rounds 8 and higher (although the number of investee companies involved is much reduced compared to earlier rounds), confirming the results of other analyses (Bradley et al. 2019). Given the importance attached to social networks in the reduction of uncertainty and overcoming physical, institutional and cultural distance for FVCs, it is of note that standalone FVC investment accounts for between 13% and 20% of all investment in rounds 1 through 4: over the period as a whole some 374 portfolio companies across the UK received a standalone FVC investment at round 1. Given that FVC relative to domestic VC is likely to be larger, later stage and technology-specific (see above), it may be expected that solo first round VC in the regions would differ in characteristics from other FVC. Overall, in terms of sector solo first round FVC is concentrated on computer software and internet specific transactions. The only statistically significant sectoral differences are that solo first round FVC investments are more likely to be in financial services/fintech and transportation and less likely to be in biotech, which is, of course, a higher risk early-stage investment, given the long lead times to exit. In terms of the size of the investment, solo first round FVC investments are not significantly different from other FVC. They are, however, more likely to be in older companies, suggesting that even in first round deals established companies with a track record of sales and market relationships and an audit trail of financials that can support a robust due diligence assessment

are perceived as less risky investments than startup or seed investments. Given the relative absence of significant differences between solo FVC and other FVC in the UK there is a clear opportunity for further research into the deal origination, screening, due diligence and investment process of solo FVC investments which do not, obviously, depend on networking and social capital relationships with domestic investors.

Insert Figure 2 here

Second, FVC involvement in first round investments has increased over time: in 2002, FVC funds were involved in only 24 percent of all first round investments in but in 2017, they were involved in 47 percent of all such deals (Figure 3). The composition of investors investing in first round has also changed, with an increase in the proportion of investments that involve both foreign and domestic VC funds and only a small increase in the proportion of standalone FVC transactions.

Figure 3 about here

4.2 FVC investments at the regional level

The remainder of this paper extends this analysis by shifting the focus from the national to the regional scale. It addresses two empirical questions: first, does the geography of venture capital investments in the UK, which is characterized by regional inequalities (Mason 2007; Mason and Harrison 2002; Martin 1989, 1992; Martin et al. 2005), extend to FVC investments? Second, what has been the effect of the increased involvement of FVC funds in the supply of venture capital, as described in the previous section, on the overall geography of venture capital investments?

Our dataset allowed us to decompose the types of venture capital investors in each region (Figure 4). Looking at the entire 2002–2017 period, it is apparent that there is a clear distinction between, on the one hand, London, the South East, South West and East of England and, on the other hand, the rest of the country in terms of the proportion of deals involving FVC investors. Northern Ireland, albeit with a very small number of recorded transactions, is a notable exception where FVC investments are driven by funds based in the Republic of Ireland (as we will see later on in this paper). Looking at the 2002-2017 period as a whole, deals involving FVC investors accounted for around 50 percent of all investments in London, 45 percent in the East of England and around 40 percent in South East and South West of England.

In Scotland and Wales, the proportion of investments involving FVC funds was around 25 percent, dropping to below 20 percent in the North West, East and West Midlands, Yorkshire and 13 percent in the North East. Figure 4 also indicates that FVC funds are more involved in regions that exhibit a high activity of VC deals, and are relatively less prominent in regions, mainly in the north and midlands, which significantly depend on publicly backed VC investments (see Mason and Pierrakis 2013).

Insert Figure 4 here

Figure 4 also suggests that Southeast England, East of England and London have proportionally higher FVC co-investment activity with local funds compared to Northern regions and the Midlands. This is made clearer in a more detailed breakdown of FVC activity by region (Figure 5), which shows that even when the FVCs co-invest with UK funds, they often do so with London based funds. The regional pattern is clear but not absolute: FVC coinvestment with London-based domestic VCs exceeds FVC investment with non-London-based VCs in the economic core region (London, South East, East England) and in the South West, with anomalous outliers in the West Midlands and Yorkshire and Humberside. In the other regions (Wales, Scotland, Northern Ireland, East Midlands, North West and North East) FVC coinvestment with non-London based VCs exceeds that with London-based ones. In other words, on balance FVC appears to replicate rather than counter the existing uneven geography of VC in the UK.

Insert Figure 5 about here

Further unpacking of the data reveals that there are significant variations between the UK regions in terms of FVC involvement in first round investments which reflect the long-standing north-south divide in the geography of VC (Mason and Harrison 2002) (Table 2). More particularly, 41 percent of first round deals made in London based companies, involved one or more FVC funds. Similarly, FVC funds were involved in 35 percent of first round investments in East of England and 28 percent in South East of England. In contrast, only 18.66 percent of first round investments involved FVC funds in Scotland, around 13 percent in Wales, West Midlands and the North West England, 11.20 percent in Yorkshire and only 7.55 percent in North East of England. Our findings are in line with previous research which suggests, first, that distance matters in VC investing (Sorensen and Stuart 2001; Cumming and Dai 2010; Vedula and Matusik 2017), and second, that host country-specific factors (such as institutional development (Balcarcel et al. 2010; Groh et al. 2010; Aizenman and Kendall 2012), economic

growth (Schertler and Tykvova 2011), smaller geographical distance (Colombo et al. 2017), common language (Aizenman and Kendall 2012), between-country trust (Bottazzi et al. 2016), closer economic integration (Alhorr et al. 2008) and strong industry networks between the foreign and host country (Madhavan and Iriyama 2009)) are important. Our analysis also suggests, however, that these country-based explanations for FVC do not necessarily play out evenly across regions in the receiving country: notwithstanding suggestions (based on within-country VC investing patterns) that there is less entry by outside VCs in more densely networked local VC markets (Hochberg et al. 2010), FVC and early-stage FVC in particular is strongly associated with the intensification of the existing spatialities of the industry in the UK (Corpataux et al. 2017).

Insert Table 2 about here

Figure 6 illustrates FVC investment as a percentage of total VC investments annually for each UK region. FVC investments in London, East of England and Southeast England have been steadily increasing in proportional terms and they are now involved in the majority of all deals made in these regions. In most other regions, while the trend in the share of FVC investments is broadly stable, there have been significant fluctuations due to the small number of deals.

Figure 7 presents the regional share (percent of the UK total) of all FVC investments by year. In 2017 London based companies received 68 percent of all FVC investments made to all UK companies, up from 36.84 percent a decade ago. In contrasts, companies based in Southeast England received only 7.45 percent of all FVCs investments made to UK companies in 2017, down from 22.81 percent a decade ago. All other regions have also been gradually losing their share of FVC investments relative to London, reinforcing the role of FVC in exacerbating the dominant role of London in the uneven geography of venture capital in the UK.

4.3 FVC fund nations investing in UK regions

Figure 8 examines the countries of origin of FVC funds investing in the UK, and shows that 53.1 percent of all FVC transactions originate from the United States, 5.8 percent from Germany, 5.5 percent from Switzerland, 4.5 percent from France and 4.1 percent from the Netherlands. At the regional level, FVC from the US dominates in almost all regions (Figure 9). This in part reflects the dominance of the US VC industry in global terms, given that portfolio companies in over 50 countries have received VC investment from US-based

investors (Pandya and Leblang 2011), and the influence of institutional similarities, a common language and a mature and transparent domestic VC market on investment patterns.

Insert Figures 8 and 9 here

4.4 Regional attractiveness to FVCs

While subject to the results of more detailed fine-grained research, we can suggest a number of possible reasons why FVC funds prefer to invest in certain regions. First, FVC will be attracted by the quality and stock of local companies and the availability of human capital (Aizenman and Kendall 2012). London and the Southeast are constantly attracting more VC investments than any other region, indicating a demand for such investments by local companies. The presence of high quality entrepreneurial firms can be a major reason that attracts a large proportion of FVC investments in London, South East, and East of England.

Second, local venture capitalists have several important roles in increasing the venture's cross-border investment readiness including advice to operational management and contributing contacts and local market knowledge (Mäkelä and Maula 2008). The strength of the network ties between foreign and local VC funds has the ability to influence credible deal flow information and this could be a reason why some regions like London and the Southeast England have higher co-investment activities compared to other regions. Poor network connections reduces a company's opportunity to receive financing from non-local VC investors (Jaaskalainen and Maula 2014). Local funds in Northern regions and the Midlands may have limited ability to establish strong social ties with foreign funds which significantly influences venture financing (Aldrich and Zimmer 1986; Jaaskalainen and Maula 2014; Wang 2016). These regions are mainly depended on publicly backed funds and some have argued that public sector venture capital funds may not be as 'smart' as their private sector counterparts in terms of adding value (Schäfer and Schilder 2009) and therefore may not appear as an attractive co-investment partner to FVCs.

VCs with internationally experienced personnel are more likely to possess a wide social network, which is vital for successful entry into new markets (O'Farrell and Wood 1994; Wright et al. 2005). By extension, it is expected that London based funds, due to their size and track record, would have established significant networks and connections with FVC funds making it easier for them to attract FVC investors in a local deal. In addition, the previous track record of London based general partners is an additional attribute that could attract FVC funds

to co-invest in Greater London regions. Since in most UK regions the local investors are mainly publicly backed funds (Mason and Pierrakis 2013), the role of policy makers is vital in ensuring access to international VC markets through increased volumes of networking opportunities for local investors that can play the role of information conduit between FVC funds and local opportunities.

5. Discussion and implications

Against the background of the rise of the global city and world city networks of capital, goods, knowledge and people (Derudder et al. 2010) as crucial producers of post-industrial growth, the findings of this paper tentatively support the argument that the internationalisation of VC is a product of the emergence of a network of global cities and their immediate surrounding hinterlands that are less distant from each other (in terms of social, cultural, economic and on occasion physical distance) than they are from the rest of the countries in which they sit (Brenner 1998; Doel and Hubbard 2002).

Given the enhanced mobility of capital, including venture capital, over the past 30 years that has been associated with a growing concentration and centralisation of investment decisions and the reduction in regional capacities for monetary creation (Martin and Pollard 2017, 3), the resulting spatial hierarchy is bifurcated between an internationally connected network of global cities that compete on the basis of attracting and concentrating investment capital and a mosaic of territories which are increasingly separated from these international capital flows and competing on the basis of innovation and cost reduction (Corpataux et al. 2017). The demise of 'proximity capital' (Crevoisier 1997) and the centralisation of the financial system (Dow 1999) is fuelling a new phase of combinations and uneven geographical development to the detriment of the regions (Corpataux et al. 2017, 84).

Our initial analysis of the distribution of FVC within the UK, therefore, confirms the argument that there is an emerging tension between the increasingly global circuits of capital and economic development outside these urban-dominated entrepreneurial and VC hotspots (Florida 2015). More specifically, although the volume of FVCs to UK companies has significantly increased in recent years, the main beneficiaries of this increase have been London and the South East, at the expense of all other UK regions which have been gradually losing their share of FVC investments. The upshot is that the UK now appears to have two FVC

markets. In London, East of England and, to a lesser extent, the Southeast England, FVCs play a prominent role and increasingly dominate investment activity, investing for the most part with local investors rather than on their own. This contrasts with Northern regions and the Midlands, regions with extensive public sector investment activity (Mason and Pierrakis 2013), where FVC investment activity is significantly limited. This points to the existence of distinct 'money cultures' (made up of people who position themselves in relation to and are positioned by the circulation of money) that vary over place and shape the networks through which money is circulated and the means whereby money is mediated, appropriated and made sense of by communities (Wray et al. 2011, 359). From this perspective the 'region' becomes a network of social relations rather than a spatial container for investment activity, and as such becomes the basis for understanding how, if at all, the connectivity of finance professionals in a locality makes a difference to entrepreneurs' access to capital within and beyond the locality.

The policy and practice of local and regional economic development plays out in the tensions between the local and the increasingly global spatialities of circuits of capital, driven by assessments of financial consequences that are made and play out outside the locality with little or no concern for the local development consequences (Lee 2010). Given the significance and geographical indifference of finance capital (including but not restricted to venture capital and private equity), the uneven temporal and spatial dynamics of circuits of capital (which includes circuits of commodity capital in the form of international trade and circuits of production capital in the form of foreign direct investment in addition to circuits of finance capital) has a significant influence on the configuration of economic activity (Fagan and Le Heron 1994). Specifically, this has implications for the possibilities of the capture of value through local development, notwithstanding the crucial significance of the embeddedness of networks in the places within which the conditions of their existence are found (Lee 2010, 200-202).

As such this transforms the social relations of production and consumption within places: if one of the outcomes of the geographical expansion of capital is the development of alternative circuits of value, which represent the negation of and isolation from capitalist social relations (Mandel 1975), then the pattern of FVC investment in the UK represents the manifestation of this dislocation between global circuits of capital, represented by the VC industry, and local circuits of value. Under conditions of post-capitalist diverse economies, this reemphasises the need for alternative types of policy (for 'other worlds' in Gibson-Graham's (2008) phrase) in which local development is founded on the practice of alternative economic geographies with circuits of value being driven by locally agreed and practical social relations (Fuller et al 2010;

Lee et al. 2004). On a small scale at least FVC can be associated with both free-standing and syndicated investment outside the core region. This is consistent with evidence from elsewhere that there are signalling and credentialising effects of public sector VC investment outside the core region, in that independent, including foreign, VCs may be attracted to invest in regions that otherwise attract little VC investment (Guerini and Quas 2016; Kovner and Lerner 2015). Where this involves syndication between government VC and independent foreign VC there is some evidence that this has a positive impact on their portfolio companies (Brander et al. 2015; Grilli and Murtinu 2014; Bertoni and Tykvová 2015). However, beyond this, the scope for effective large scale change is limited: the development of micro-level initiatives, such as business angel groups and networks, and the realisation of autonomy from global circuits of capital through public sector VC funding initiatives and their leverage on independent, including foreign, VC may in practice have limited and localised material consequences (Amin et al. 2002).

6. Conclusion

The globalisation of venture capital and its increasing concentration on networks of global cities represents a major disruption to local circuits of value creation and thus to the possibilities of the capture of value as the basis for local economic development. Our analysis of the UK context shows that the increasingly global circuits of venture capital flows has for the most part reinforced rather than ameliorated the uneven geography of VC in the UK. This is reflected in a growing tension between globalising value flows and a desire for a territorial development logic to maximise intra-regional flows and connections and the volume of activity within a region (Hudson 2011). The public policy implications are clear: the volume and scope of national or regional VC promotional initiatives are likely to have limited success unless they are fully integrated with the global circuits of venture capital, facilitating the flow of money, knowledge and information between local players and global VC hubs. However, there is no 'one size fits all' prescription: as research in venture deficient regional economies in the UK has demonstrated, there is considerable heterogeneity in local economic, institutional and financial architectures which will shape the ability of regional actors to build and exploit these wider connections (Wray et al. 2011). While FVC for the most part reinforces the spatialities of a globalising industry, exploring the characteristics, motivations and mechanisms of free-

standing FVC outside the core London-centred region, and examining in more detail the extent and impact of syndication with government VC, offers the prospect of uncovering some key inflection points that can ameliorate if not reverse the regional effects of the globalisation of venture capital investment.

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Tables

Table 1. Descriptive statistics

Variable	Number of observations	Percentage of total
Deals without FVC investments	3710	62.5%
FVC co-investments with local funds	1263	21.3%
Standalone FVC investments	959	16.2%
Number of deals	5932	
Investments by region		
Northern Ireland	59	1.1%
Scotland	431	7.7%
Northeast England	169	3.0%
Northwest England	313	5.6%
Yorkshire	206	3.7%
East Midlands	144	2.6%
West Midlands	185	3.3%
East of England	682	12.2%
Wales	129	2.3%
London	2039	36.6%
Southwest England	272	4.9%
Southeast England	942	16.9%

Table 2. The proportion of FVCs per investment round for each region, 2002-2017

Round Number	*London %*	*Northern Ireland %*	*Scotland %*	*North East England %*	*North West England %*	*Yorkshire-And-The-Humber %*	*East Midlands %*	*West Midlands %*	*East of England %*	*Wales %*	*South West England %*	*South East England %*
Round 1	**41.38**	**40.62**	**18.66**	**7.55**	**12.43**	**11.20**	**10.60**	**12.62**	**34.97**	**12.82**	**21.57**	**27.88**
Round 2	53.64	53.84	25.80	18.91	18.51	9.61	24.24	16.13	41.22	24.00	33.96	34.82
Round 3	60.89	75.00	35.41	36.36	14.28	11.32	20.00	21.05	47.12	41.66	28.57	41.30
Round 4	67.00	67.00	31.25	33.00	9.00	4.76	12.00	23.07	60.00	66.67	48.00	43.33
Round 5	56.96	100	25.00	25.00	33.00	5.26	40.00	42.85	47.05	50	55.55	44.83
Round 6	52.00	100	23.07	14.28	40.00	1.00	33.00	20.00	43.24	50	58.34	52.50
Round 7	51.42	100	42.85	.	67.00	1.00	50.00	.	56	50	42.85	48.39
Round 8	58.82	100	50.00	.	.	.	.	.	59.09	.	66.67	55.56
Round 9	77.00	100	.	.	.	.	.	.	43.75	.	100	46.67
Round 10	50.00	100	.	.	.	.	.	.	50	.	100	55.56

Figures

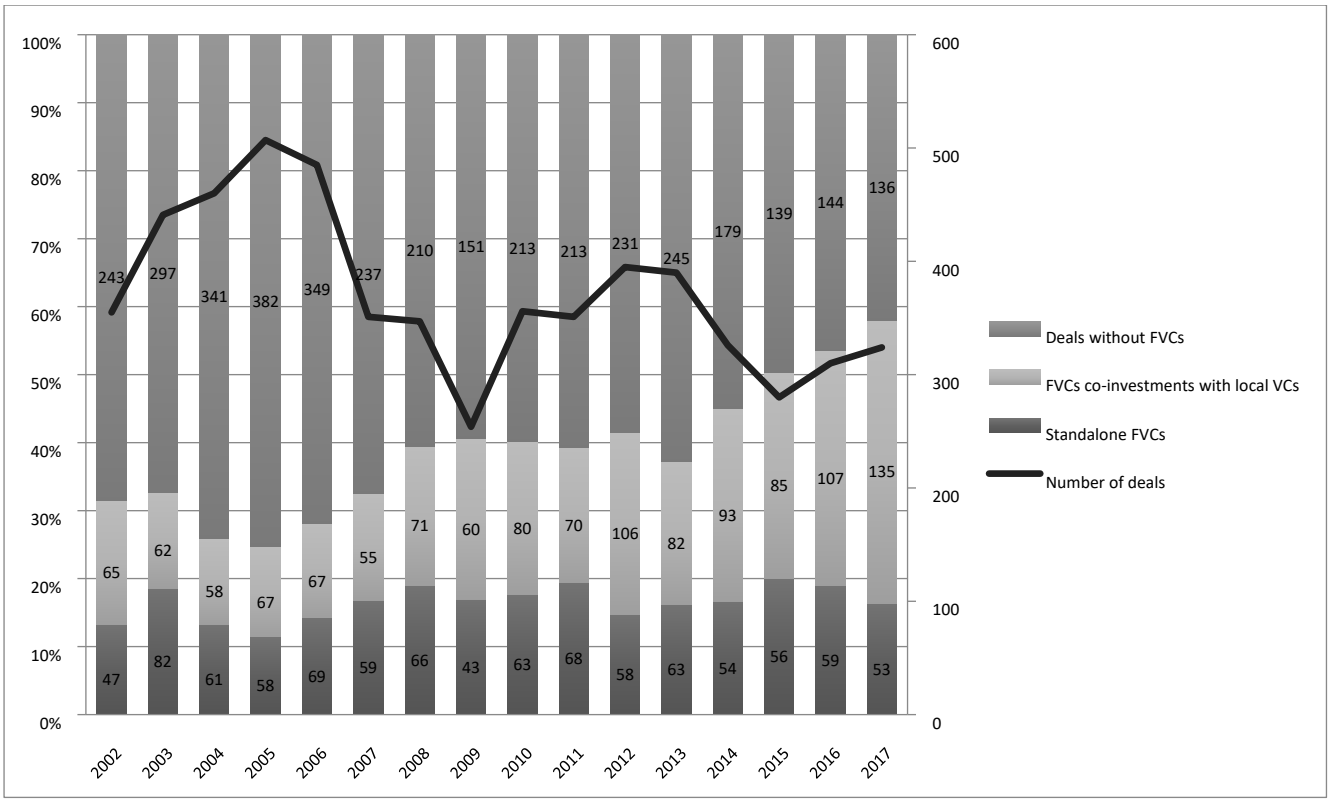


Figure 1. FVC investments in UK based companies, 2002-2017

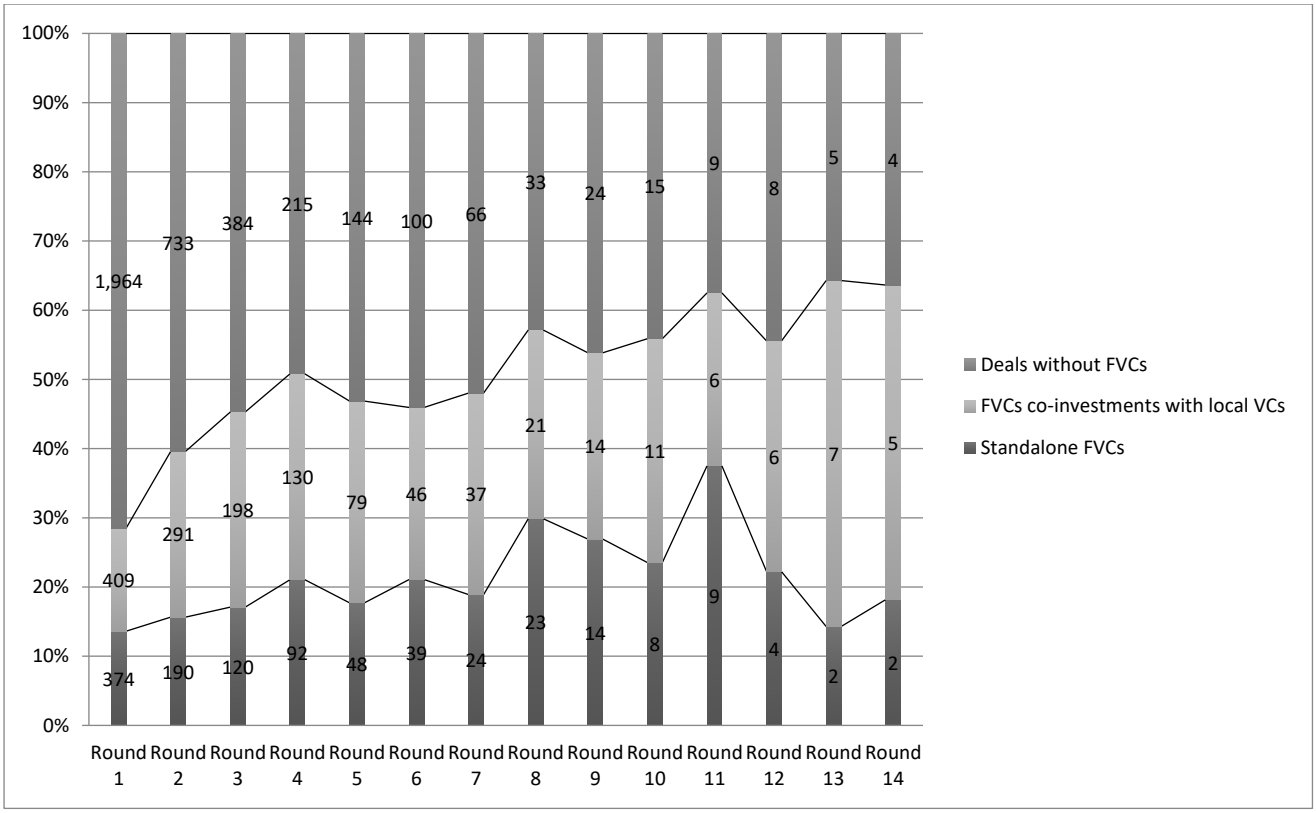


Figure 2: FVC investments by round, 2002-2017

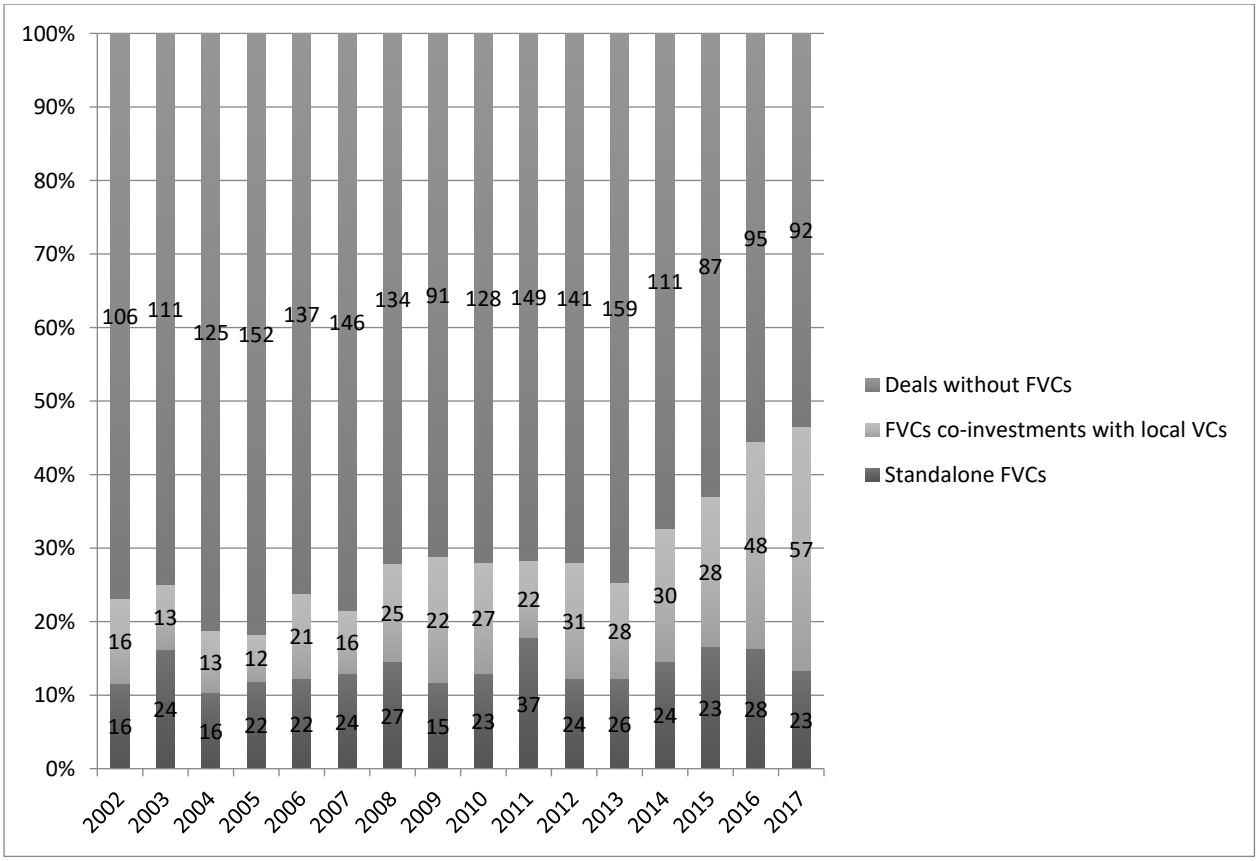


Figure 3: FVC in first round only investments, 2002-2017

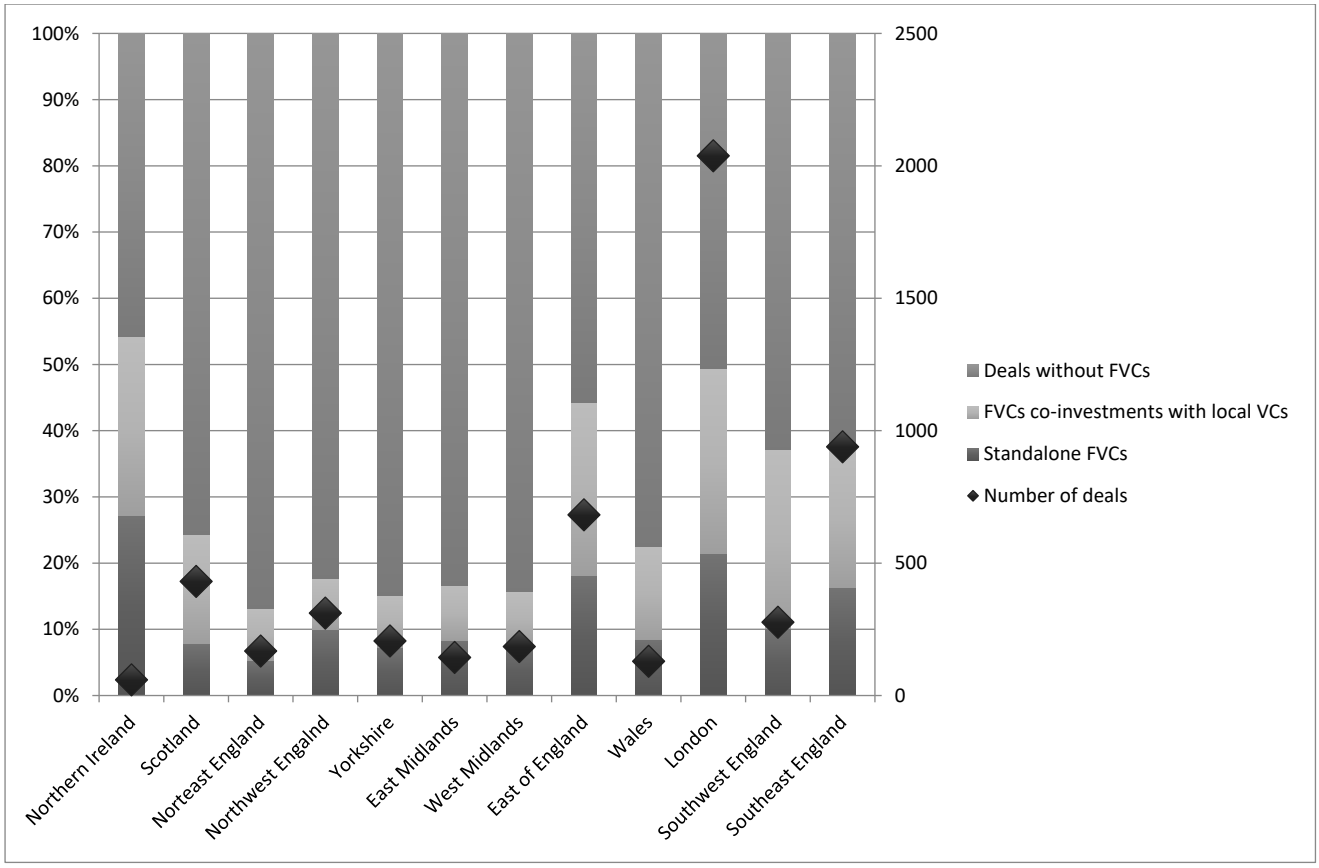


Figure 4: Regional distribution of FVC investments, 2002-2017

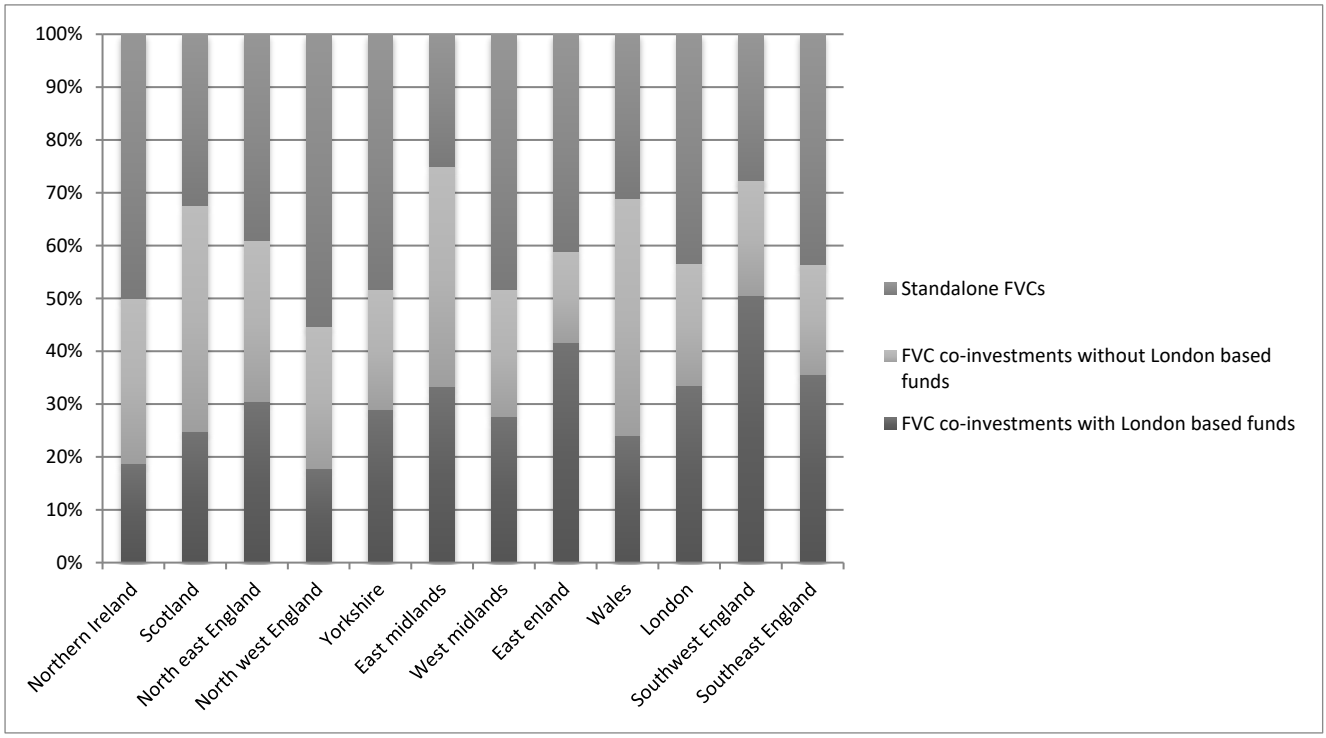


Figure 5: Breakdown of different types of FVC investments, 2002-2017

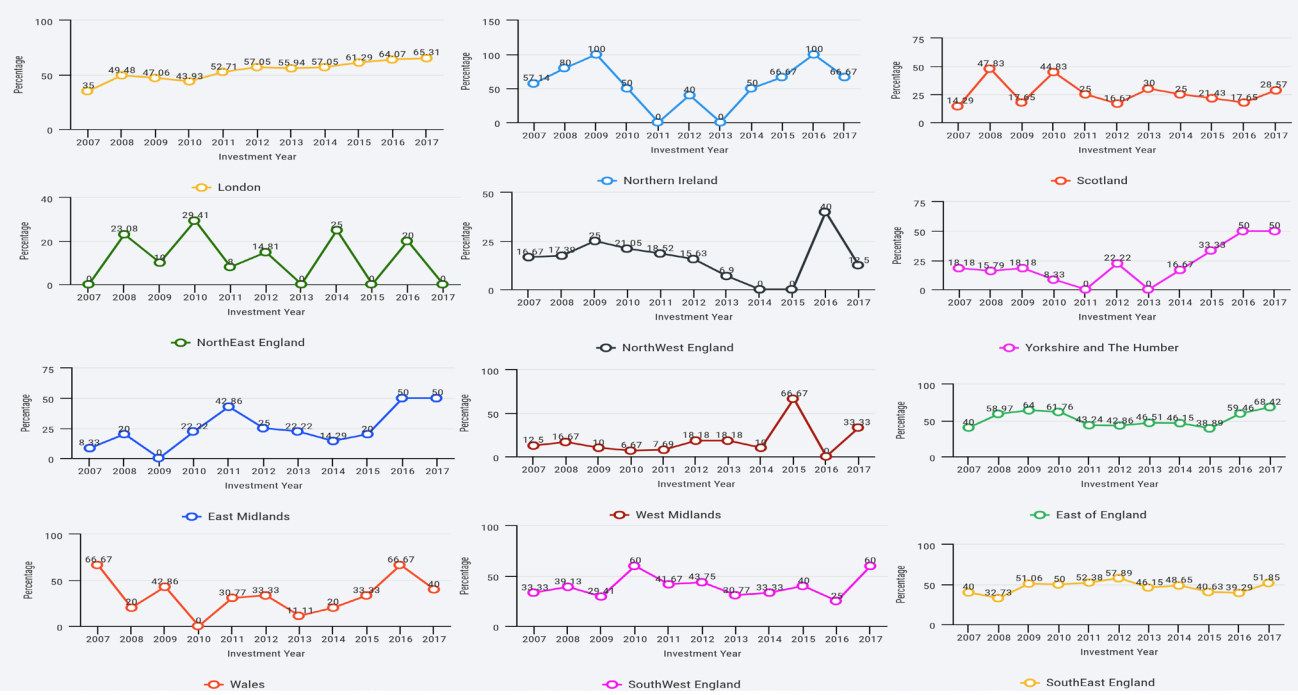


Figure 6: Proportion of FVC investments by region and year, 2007-2017

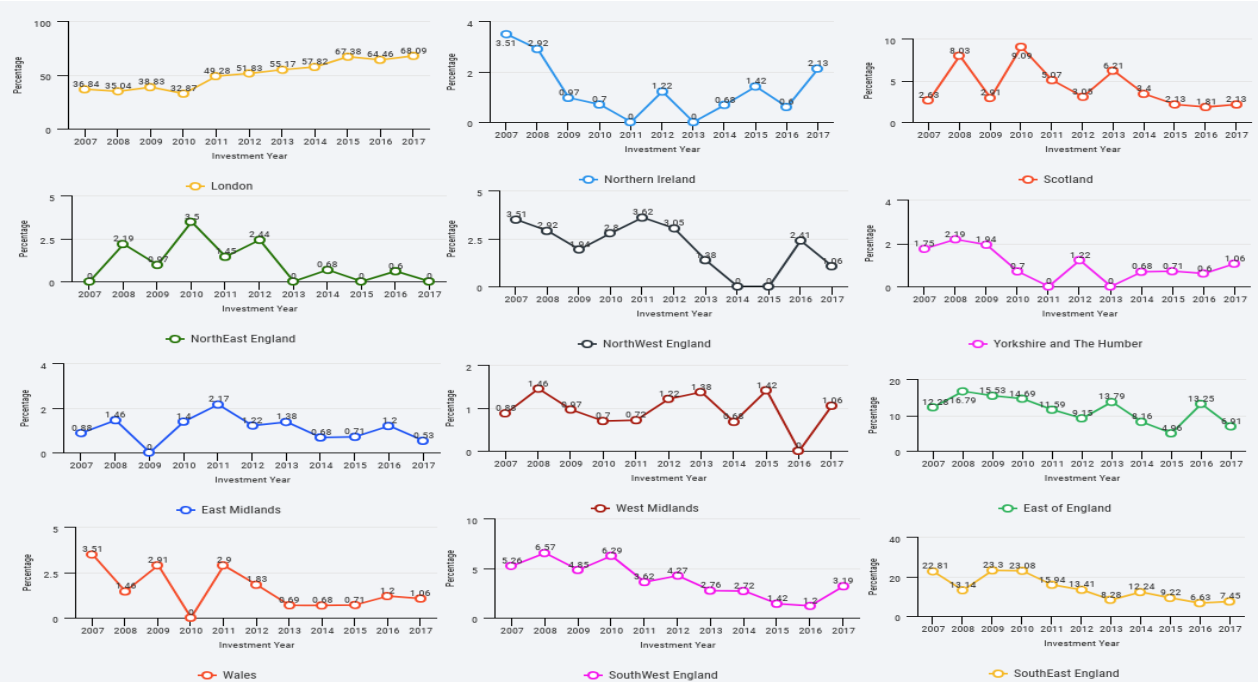
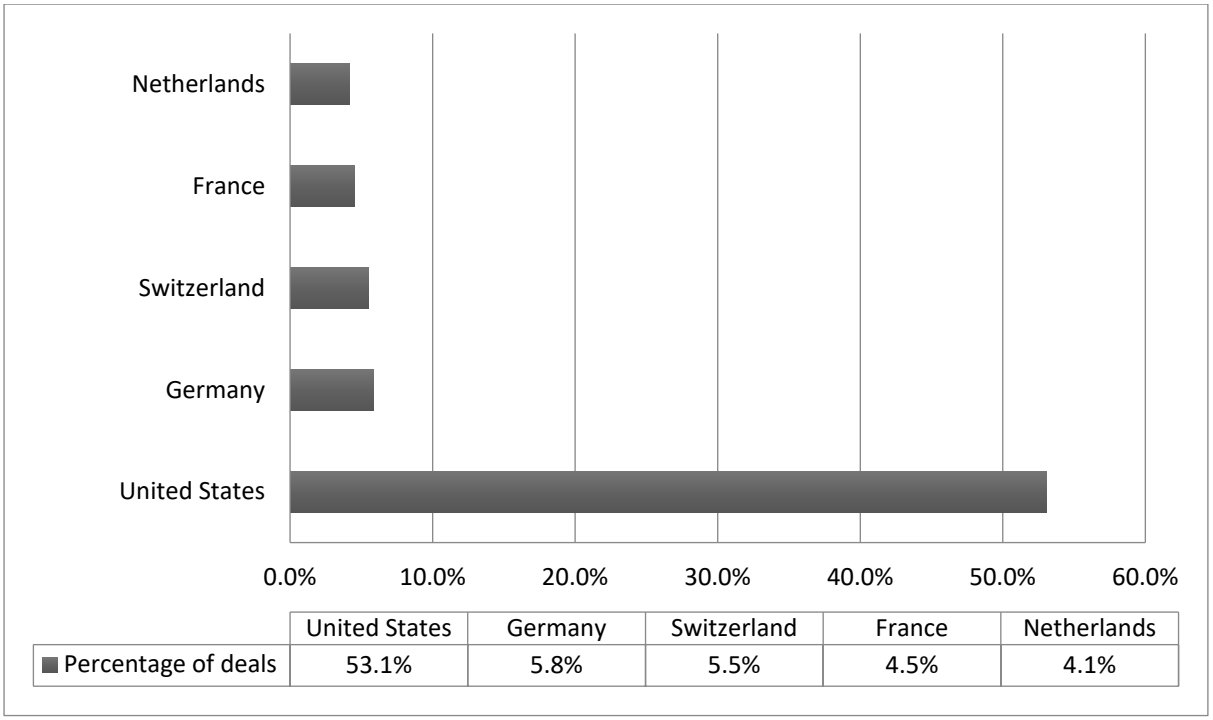


Figure 7: Share of FVC investments by region and year (UK=100%), 2007-2017



	United States	Germany	Switzerland	France	Netherlands
Percentage of deals	53.1%	5.8%	5.5%	4.5%	4.1%

Figure 8: Top five FVC fund nations investing in UK, 2002 – 2017

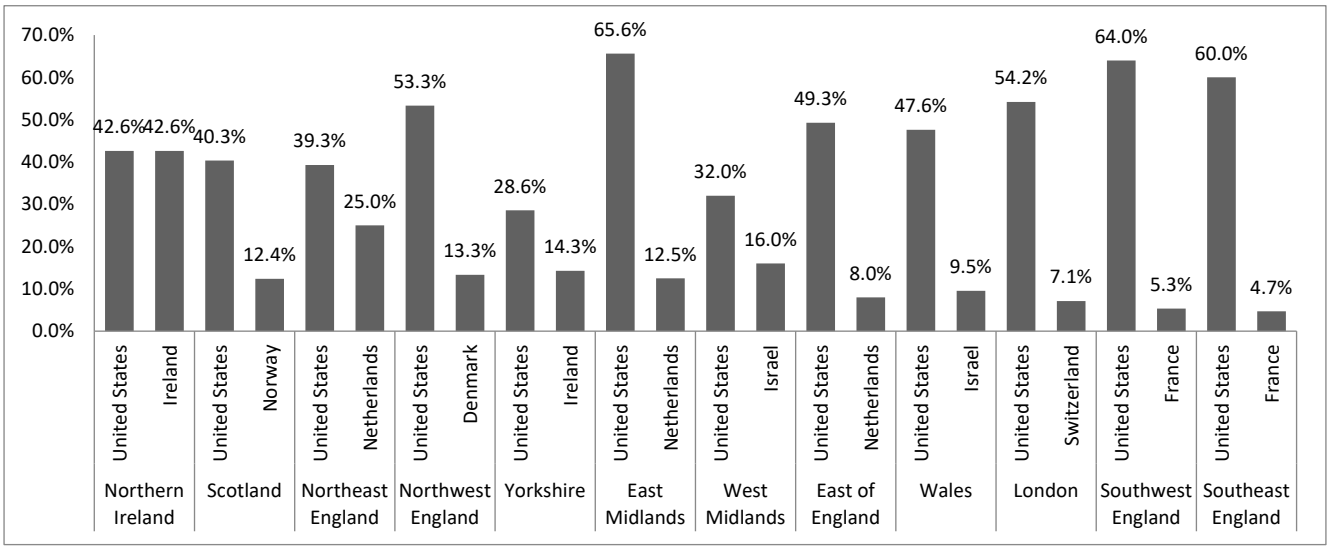


Figure 9: Country of origin of FVC transactions in each UK region, 2002-2017