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## Regional income disparities, monopoly and finance

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**The overall rise in inequality in the USA since 1980 has been matched by a rise in inequality between places; local and regional development policies aimed at reversing this polarisation have seen limited success. We propose an explanation for the spatial polarisation of prosperity and the failure of the policies to remedy it. Our explanation is based on the interaction of monopoly power, agglomeration economies in technology clusters and the power of financial sector actors over non-financial firms—all phenomena characteristic of the post-1980 economy. We review evidence for each of these elements and propose some causal relationships between them, as an outline of an ongoing research programme.**

*Keywords:* regional income distribution, monopoly, technology clusters, platforms, financialization, spatial inequality

*JEL Classifications:* F61, F62, F65, O33, R11, R12

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### Introduction

The paradox of our time is that we live with powerful technology accompanied by stagnating wages, increasing income inequality and a general malaise. While some choose to debate issues of measurement and magnitude, after [Piketty and Saez \(2003\)](#), it is impossible to ignore the preponderance of evidence that individuals and communities have not shared equally in economic prosperity over the past

40 years. A small percentage of individuals are doing well, while the incomes of the vast majority of the population have stagnated.

This polarisation of income and opportunity has a distinct spatial dimension: corporate headquarters and good jobs have clustered in certain *places*, while other places are left behind. The spatial polarisation appears connected with political polarisation. Regional and local development policies, aimed at

reducing spatial inequality, often focus on promoting innovation and entrepreneurship to enhance the performance of relatively deprived places or populations. The logic is that places that are able to successfully launch innovative companies will achieve some competitive advantage and capture new industries, with the opportunity for new jobs, building related local supply chains and wealth creation. Yet, over the past four decades, this model has not worked to create prosperity in most places.

We propose an explanation for the frequent failure of local development policies. We consider three interrelated phenomena: the growing polarisation of income and opportunity between particular wealthy cities and other places left behind; the growth of market power of non-financial corporations; and the growing power of the financial sector, reflected in both its influence over non-financial firms and its share of total corporate profits. We consider the US case where the growth of all three forces since roughly 1980 is well documented. We propose an understanding of how the three forces interact and reinforce one another as an outline for an ongoing research agenda and to encourage others to examine these issues.

The most pronounced growth in market power has been in sectors commonly called *tech*: Web-based platform businesses, general-purpose software and businesses relying on strong intellectual property protection, such as pharmaceuticals and biotech. These are also industries with the most pronounced propensity to cluster spatially, which standard theory attributes to agglomeration economies. Yet, in today's tech markets, monopoly power and agglomeration economies reinforce one another. This gives tech agglomerations a gravitational pull for tech start-ups, an attraction that can seldom be matched by other places seeking to find their own niche in the tech world.

Growing firms need capital. Reforms to the regulation of pensions, corporate governance and the financial sector have enhanced the power of financial sector actors to redirect

resources from firms that are less profitable to firms with higher earnings prospects; the prospect of higher earnings is often based on the expectation of market power and monopoly rents. With a growing tech-monopoly sector, the less profitable firms operating in classically competitive markets are stripped of assets or their cash flow is captured and redirected to higher return activities. Because the tech-monopoly firms are clustered in certain cities, the transfer of resources from less profitable firms to the monopoly sector has a distinct geographical bias. Thus, the gulf in opportunity separating tech clusters and left-behind places is driven not only by the power of the tech firms in the markets for their services, but also by the power of the financial sector. Growing market concentration in banking and, with it, greater *spatial* concentration of banking further reinforce the spatial concentration of business growth.

The spatial concentration of prosperity is often understood as the product of new technologies and of the process of technological development. We argue that it is, at least as much, the product of deregulation of finance and of network industries and of raising the legal threshold for abuse of market power. That this neoliberal agenda was enacted in the name of creating prosperity through entrepreneurship and competitive markets is an irony that we will not dwell on.

These elements—growing disparities between certain wealthy agglomerations, notably in tech and finance, and the rest; growing market power, most conspicuously that of platform companies such as Amazon and Google; and the enlargement of both the profitability and the influence of the financial sector—are all well documented. Each is also complex, and even more so when considered all together; here, we do not attempt to provide evidence for causal relationships. Our intention, rather, is to review evidence and to propose a certain set of relationships as the basis for a future research agenda.

We begin, in the next section, by presenting evidence about changes in the geographic

distribution of income in the USA over the past 40 years. The section on ‘Monopoly’ discusses the growth of monopoly power, particularly in relation to network economies, digital platforms and intellectual property rights. The section on ‘Marshallian externalities meet monopoly power’ lays out our understanding of the mutually reinforcing interactions between Marshallian agglomeration economies and technology-based monopoly. In the section on ‘What harm does monopoly do?’, we consider ways in which such techno-monopoly clusters hold back the development of places outside the clusters and offer no comfort to many of their own residents outside the charmed tech sector. The growth of financial influence, the increased market and spatial concentration of the banking sector and the role played by finance in spatial polarisation of prosperity are discussed in the section on ‘Finance: feeding monopoly, holding others back’. The section on ‘Implications and conclusions’ concludes with suggestions for further inquiry.

### The changing geography of prosperity

To capture disparities between incomes of different places, we follow [Reeves’ \(2017\)](#) focus on the top 20% of earners. In Reeves’ account, this group has done relatively well due to skill-biased technological change. Geography is absent from Reeves’ considerations, but his construct is useful in examining the changing geography of prosperity. [Figure 1](#) shows the share of employed people with earnings above the 80th percentile, or the top 20% of the US earning distribution, in 1980 ([Figure 1a](#)), 2016 ([Figure 1b](#)) and the change from 1980 to 2016 ([Figure 1c](#)). Data are shown for commuting zones, with map areas proportional to population.

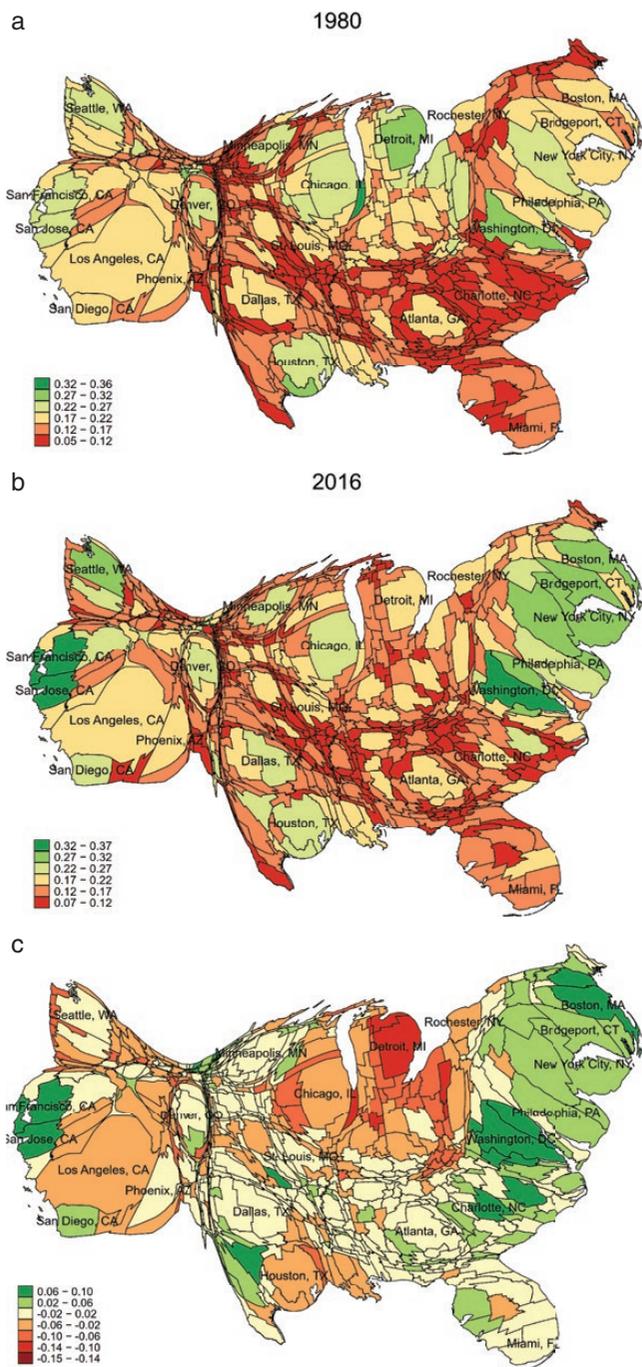
In 1980, the highest concentration of well-paid workers was in Gary, Indiana—a steel manufacturing centre just east of Chicago, followed by Detroit (car manufacturing) and

Washington DC. In 2016, the highest concentration of well-paid workers was in Washington DC, followed by San Francisco-San Jose, New York and Boston. Looking to the change in position from 1980 to 2016—each locality’s rise, or fall, in the share of workers earning more than the 80th percentile nationally—the big winners were Washington DC, Boston and San Francisco-San Jose, along with secondary hubs in banking (Charlotte, North Carolina) and technology (Seattle, Washington; Raleigh-Durham-Chapel Hill, North Carolina; and Austin, Texas). Places in the middle of the country lost higher wage earners: most of the industrial heartland declined in relative terms, including yesterday’s technological leaders, such as Detroit and Rochester, NY (once the centre of imaging technology, home of Kodak and Xerox). Simply being a large city, seat of many large corporations and, one might think, doing well from agglomeration economies ([Gaspar and Glaeser, 1998](#)), is not enough: large metropolitan areas in both the sunbelt and the Midwest, places such as Houston, Los Angeles, Chicago and Atlanta have all grown in population but not in their shares of better-paid jobs.

Some of the spatial concentration of better-paid jobs might be put down to simple localisation economies, skill-biased technological change and the consequent emergence of specialised headquarters clusters (for example, [Moretti, 2012](#)). Yet, as we celebrate and encourage entrepreneurship, current technologies exhibit a winner take-all-dynamic, which creates monopoly power (for example, see [Weitzel et al., 2006](#)): notably, the current concentrations of high-paid jobs are located in places with headquarters of well-known firms that demonstrate monopoly power.

### Monopoly

We live in a time of a resurgence of monopoly power. This is seen in both non-financial and financial sectors (see section Finance: feeding monopoly, holding others back later). In



**Figure 1.** Share of employees in a commuting zone with earnings above 80th percentile of national earnings distribution. (a) 1980. (b) 2016. (c) Change from 1980 to 2016.

non-financial industries in the USA, cost-price markups<sup>1</sup> have grown substantially since 1980 (De Loecker and Eeckhout, 2017; Eggertsson et al., 2018). A similar pattern is seen in other countries, although the US case is one of the more pronounced (De Loecker and Eeckhout, 2018). The rise is evident across most sectors: Grullon et al. (2018) find that three-quarters of all US industries became more concentrated between 1997 and 2012—but the concentration is far greater in those which are more digitally intensive (see Calligaris et al., 2018, using the index of digital intensiveness from Calvino et al., 2018). Moreover, the rise in mark-ups is found only in the top half of each sector, ranked by mark-ups, while the bottom half is essentially unchanged (Calligaris et al., 2018), consistent with the view that market power today is exercised not by classic oligopolies but in winner-take-all games, the winners being what Autor et al. (2020) call *superstar firms*. Hsieh and Rossi-Hansberg (2019) study industry concentration, rather than mark-up, in broad industry categories for the USA: they find sharply increased concentration in wholesale, retail and other services (but not in manufacturing or utilities). The increased concentration in banking has been even more dramatic, with the emergence of national banking, replacing 50 distinct and more locally focussed state banking systems (Berger et al., 1995). Currently, banking in the USA is dominated by a small handful of banks.

Among non-financial corporations, our interest is in information and communications technologies (ICT), particularly Web platforms and general-purpose software and also sectors such as pharmaceuticals, biotech, digitised entertainment and publishing that are heavily dependent on intellectual property protection. As a shorthand, we will call all of these sectors information-based, as in all replicable code is the basis of increasing returns. All enjoy extremely low marginal production costs for a given product and thus economies of scale; companies adopt business models

focussed on internalising the benefits of those scale economies.

Looming largest are the platforms: business models based on linking two sides of a transaction parties—customer and supplier in Amazon’s ‘marketplace’, friends on Facebook and search on Google. The power now exercised by platform business is widely recognised: as Kenney and Zysman (2016, 62) put it, “We are in the midst of a reorganization of our economy in which the platform owners are seemingly developing power that may be even more formidable than was that of the factory owners in the early industrial revolution”. Amazon takes its cut from all the small businesses that sell via its marketplace—and keeps the sales record and customer information. Indeed, 21 large companies, with publicly traded shares, are generating 10% or more of their revenue from sales through Amazon (Kim, 2017).

Closely related to the platform models are businesses based on proprietary general-purpose software, such as Microsoft’s Office applications and the Windows operating system. We do not call these platform models as they are not two-sided—they are not linking customer and seller, for instance; like the platforms, however, they are network businesses. That is to say, existing users benefit when the number of users rises (Evans, 2003; Gawer, 2010; Rochet and Tirole, 2006): much of the value of Microsoft Office lies in the fact that its files can be read reliably by other Office users.

Sectors such as pharmaceuticals, biotechnology and digitised entertainment and publishing share some salient characteristics of the Web- and software-based business models: extremely low marginal cost and thus increasing returns. The model is based on establishing and enforcing intellectual property rights, which set up monopoly rights over a discovery or idea.

Putting all of these business models under the umbrella heading of monopoly risks confusion, because their behaviour is different. A pharmaceutical company with a patent-protected drug

**Table 1.** *Monopoly models of the information age.*


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Interface standards to prevent the emergence of competing products

- Microsoft: document formats & Windows APIs. Has prevented competing (often free) desktop applications & PC operating systems. Note that the threat is not copying Microsoft's software—it is free communication with it!
- Apple maintains similar control of its system (which is, ironically, built on top of the open-source operating system BSD Unix)

Sale to advertisers of personal information from search or social networks

- Google & Facebook
- Also, any social network (Twitter, Instagram...)—the others just aren't as successful as the big two

Tollgates to network products

- Google uses Android (built on open-source Linux) as gatekeeper for phone aps; Apple does the same for iPhone
- Amazon: search, reviews and fulfilment
- Academic publishing—Elsevier, Springer and Taylor & Francis. The network is the journal's history & reputation.
- Bookers: Trip Advisor, Booking.com, Airbnb, Expedia, Uber, ...

Simple intellectual property

- Pharma
- Biotech—Monsanto's seeds
- Hollywood

Old fashioned networks, wired and wireless

- Deregulation, privatisation and the advent of mobile have made telecoms and television networks into sources of some of the world's great new fortunes

ICT-enhanced scale economies for brick-and-mortar businesses

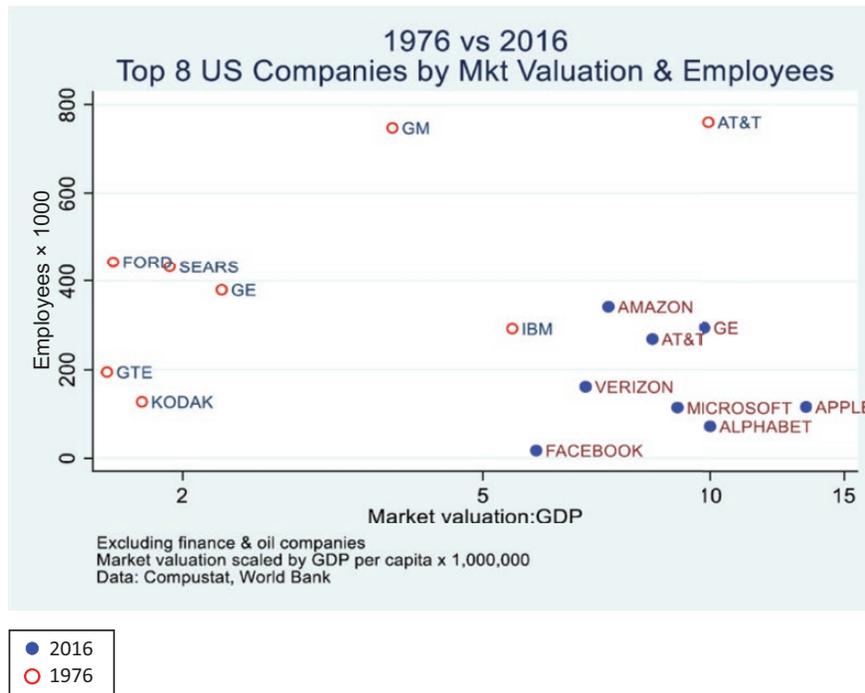
- Retail, wholesale and other services. See [Hsieh and Rossi-Hansberg \(2019\)](#)
- 

may have a simple textbook monopoly relationship with customers and will be finding the profit-maximising price until the patent expires. Network businesses, because they become more valuable to each customer as more customers are added, may have a particularly strong motivation to engage in price discrimination and to add new product lines/features to attract additional network users. Platforms—those serving primarily as intermediaries between customer and supplier—have complex pricing problems to solve (see [Rysman 2009](#), for a summary). A network or platform business may find it rational to lose money initially in order to establish market dominance—an issue considered by [Khan \(2017\)](#) with regard to the (failed) anti-trust case against Amazon. We see another example with Uber, which went public in 2020 with a market value of \$70 billion in the face of an annual operating loss of \$3 billion: investor decisions are not based on current or short term earnings but are betting on future

monopoly profits given the company's potential for market dominance.

The main models of monopoly and examples are provided in [Table 1](#). Here, we include among information-based monopolies any business that is designed to make supra-normal profits from increasing returns (that is, low marginal cost) through either exclusive rights to the product (for example, a patent on a drug or a chip design) or the lock-in effects of a network product.

Monopoly power is reflected in a company's market valuation. [Autor et al. \(2020\)](#) argue that a set of superstar firms has higher mark-ups and a lower share of labour in sales and value added. As superstar firms gain market share across a wide range of sectors, the aggregate (sector-wide) labour share falls. [Figure 2](#) shows market valuation (as a share of GDP) and employment for the eight largest non-financial, non-oil US-based companies in 1976 and 2016, 40 years apart. As per the 2016



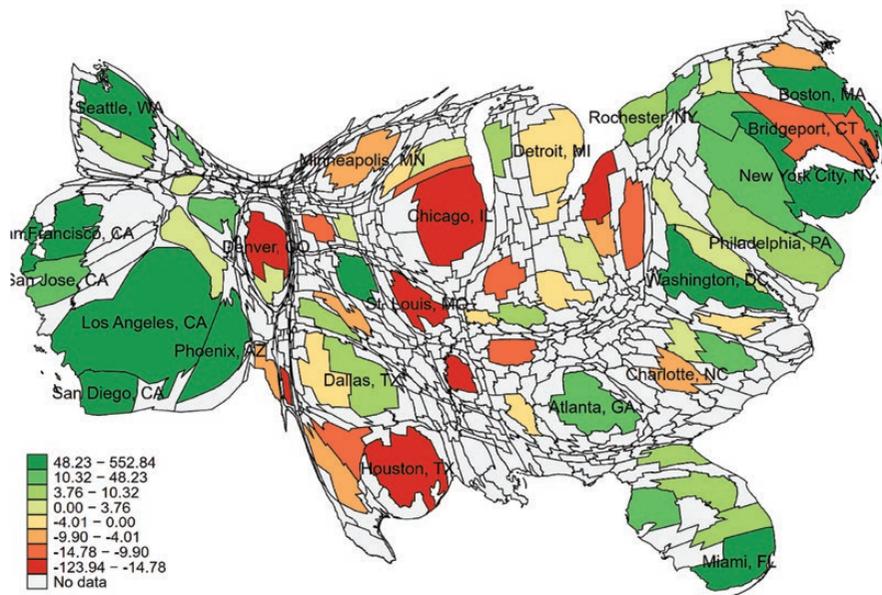
**Figure 2.** Largest non-financial, non-oil US-based companies: market valuations and employees worldwide.

market valuations, shares of GDP are around five times higher while employment has fallen by about half. In 2016, seven of the eight companies are based on a network model, with GE as the only non-network company. In 1976, just two of the eight, AT&T and IBM, were network companies—and these two were outliers in terms of market. The majority of the 2016 cohort of top companies in terms of GDP share are network companies that have moved to platforms. Most remarkable is how employment, relative to market capitalisation, in 2016.

Of particular interest to us here is the geographical distribution of monopoly power and of its growth. A rough valuation of monopoly power is given by the ratio of market valuation to book value—an approximation to Tobin's Q. For each travel to work area that was home to the headquarters of at least five non-financial firms in the Compustat dataset in both 1980 and

2016, we calculate this ratio on an aggregate basis summing market valuation and assets across all firms in the area and then considering the change in that ratio between 1980 and 2016. The results are shown in Figure 3. We see large rises in the ratio of the technology-heavy cities of the west coast and northeast and—despite a substantial rise in the ratio for the USA in aggregate—declines in much of the industrial Midwest.

The causes of this remarkable growth in market power are complex and, of course, contested. Many industries—energy utilities, transportation, telecommunications and banking—were substantially deregulated, a process that started in the 1970s. The courts accepted a reinterpretation of the theoretical construct of competition, originating from the University of Chicago and, in particular, Robert Bork (1967), which made it more difficult to regulate anti-trust-based market



**Figure 3.** Change in ratio of market capitalisation to book value of assets, 1980 to 2016. Shown are all commuting zones for which data were available for at least five non-financial firms in both years. Source: Compustat.

power. Laws were passed forbidding Federal government purchasers from using their considerable bargaining power to bring down the prices of pharmaceuticals (Engelberg, 2015). Intellectual property rights were applied to new categories (patents were extended to software—adding to existing copyright protection—and living organisms, for instance), secured globally through TRIPS and in many cases extended in length.

And, of most central importance, applications of digital technology create processes that exhibit significant economies of scale and scope. We cannot say that, however, without this warning: a company's (Amazon, say, or Google) success in *internalising* the inherent benefits of the technology to secure market power does not imply that monopoly is technologically pre-ordained or somehow natural. The appropriation of monopoly rents may be aided by suitable technologies, but ultimately it depends on institutions, which are, in turn, dependent on political choice. As Philippon

(2019) shows, recent decades have seen the US economy become broadly less competitive than the economies of the European Union, a fact that is certainly due to differences not in technology but in institutions.

### Marshallian externalities meet monopoly power

In competitive markets, geographic concentrations of economic activity can benefit from localised external increasing returns, also known as agglomeration economies. In contrast, monopolies are companies that successfully internalise the benefits of increasing returns. What happens in leading technology clusters today is this: the external returns of the clusters interact with the internalised increasing returns of companies with market power; each amplifies the other.

Specialised concentrations of innovative firms—iconic places such as California's Silicon Valley or the Route 128 halo around

Boston—are often understood entirely in terms of agglomeration economies: as virtuous circles in which localised rivalry and partnership between firms generate skills and innovation, raising productivity, wages and profits and making products that increase social welfare. Marshall gave three reasons for firms to co-locate in such clusters: proximity to a pool of skilled labour, knowledge spillovers (‘in the air’) and value chain proximity—specialised suppliers and customers (Marshall, 1890). From the 1970s onward, neo-Marshallian work has brought into this picture local public institutions; universities; trade associations, consortia and other manifestations of formal inter-firm cooperation; social networks as facilitators of trust, reduced transaction costs and knowledge sharing; government R&D spending; and knowledge-seeking multinational corporations.<sup>2</sup>

A theme through much of this research—and underlying the policies that emanate from these ideas—has been that agglomeration economies raise both the static and dynamic innovative productivity of relatively small firms, to the extent that a resource-rich agglomeration is often seen as a place where small- and medium-sized enterprises (SMEs) and entrepreneurial newcomers can compete with established giants. This view began with studies of intermediate technology industries in Italy and Germany (for example, Becattini, 1989; Schmitz, 1992), but was quickly extended to the Silicon Valley in Saxenian’s (1994) classic study, in which the apparently free flow of knowledge in that cluster was contrasted with the secretive, vertically integrated environs of Boston. This impression that clusters are gardens of SMEs persists despite plentiful evidence on the key role of large firms—Feldman calls them ‘anchor tenants’—in clusters (Best, 2001; Feldman, 2003; Klepper, 2011); arguments that the SME-based industrial district is not a stable configuration, drifting over time towards large firm dominance (Farrell and Knight, 2003; Harrison, 1997); often symbiotic relationships

between multinational corporations and clusters (Belussi and Sammarra, 2009); and the fact that the Silicon Valley was created as much by venture capitalists and intellectual property lawyers in the search for new business models as by the free flow of engineering knowledge (Kenney and Florida, 2000; Suchman, 2000). And yet, this literature addresses problems of power relationships between large and small firms within clusters but is silent on any possible relationship *between* clusters competing in the same industry.

Monopoly—and just as much, the prospect of creating a new monopoly—amplifies Marshallian external economies by increasing the value of skilled labour, of knowledge spillovers and of supplier proximity; it also creates a considerable value in the proximity to a market for both financing and acquiring start-up companies. Autor et al.’s (2020) superstar nomenclature is borrowed from a theory about superstar pay for individual performance (Rosen, 1981; Sattinger, 1979) and is applicable to superstar firms: in the winner-takes-all world of information-based monopolies, the value of technical or managerial staff who are even slightly better, and of technical and market intelligence that is even slightly more complete or up to date, might make the difference between market dominance and irrelevance (Frank and Cook, 1995). The most productive resources are found in the place that dominates an industry, creating reinforcing feedback that amplifies differences between places.

Skill-biased technological change (SBTC) is typically used to explain the growing gap between the wages of workers. The hypothesis is that new technologies have raised the demand for skilled labour, relative to unskilled labour, faster than the relative supply of skilled labour has grown (Goldin and Katz, 2008; a good example of the application of this theory to the disparity between wages in tech clusters and wages in other places can be seen in Moretti, 2012). Setting aside the various shortcomings of SBTC as an explanation for the rise in earnings

inequality,<sup>3</sup> we simply note that market power is not the same as technology. Market power in the technology sector, with its winner-takes-all dynamics, raises the marginal revenue product of the best-skilled labour. SBTC may also be a factor, but we should not mistake high wages paid to optimise rent-seeking in a technologically dynamic winner-takes-all market, for evidence of SBTC.<sup>4,5</sup>

In technology sectors today, an additional benefit to location within a major cluster is found in finance and in the related market for corporate control.<sup>6</sup> The ecology of start-ups and their growth, or successful exit through initial public offering (IPO) or acquisition, rewards proximity both to venture capitalists and to large firms in related segments (Kenney, 2011; Kenney and von Burg, 1999). The firms that get preferential treatment are called high-growth start-ups and are in industries where a new product or business model is scalable, with the potential to dominate particular market segments (for example, Zeller, 2007). For both founders and investors, then, high-growth start-ups are speculations on potential monopoly. Venture capitalists and start-ups thus have a mutual interest in locating in large tech agglomerations and in the city regions that host them. This has reinforced relationships of spatial dominance and dependence—or territorial hierarchies—between monopoly-based clusters and areas relying on competitive industries in the USA (Audretsch and Feldman, 1996; Feldman and Florida, 1994; Susman and Schutz, 1983). In Europe, there is more variation, which reflects the patterns of spatial organisation of industrial production and capital markets differences across countries (Klagge and Martin, 2005; Martin et al., 2002, 2005).

Large firms, too, share in the benefits of co-location with start-ups and venture capital. While a few start-ups grow large, most either fail or are acquired by larger firms; being acquired on favourable terms is the principal business objective for many founders and the venture capitalists. A strategy of the larger

firms, such as Apple, Google and Facebook, is to either acquire their younger competitors or kill them. Proximity mutually benefits the strategies of both the large incumbents and the high-growth start-ups.

Monopoly thus increases the gravitational pull of agglomeration economies: both the established monopolies and startups—the would-be monopolies—prefer to locate there. People in other places make plans to find their own tech niche, with the aim of growing into a new Silicon Valley, but they have faint hope for realising returns on their investments.

### What harm does a monopoly do?

There are three sets of reasons we should worry about the increase in monopoly power. First, there is the polarisation of income *within* the wealthy and growing technology clusters. People living in these places who are *not* the beneficiaries of high tech-driven incomes can no longer afford homes and witness a decline in their living standards. Second, monopoly power has a general deleterious effect on society due to the distributional impacts of monopoly rents that result in higher prices and lower innovation. Third, there are specific distribution effects on places *outside* the tech- (and, as we shall see, finance- and government-) clusters: places sometimes called “left behind” but, we will argue, could better be described as “held back”.

Basic theories of city growth tell us that big cities have higher costs, due to congestion (Gaspar and Glaeser, 1998). Big cities also enjoy higher productivity of labor, for reasons we know from Marshall (1890) and Jacobs (1961): sharing the services of specialist workers and firms, and lumpy infrastructure; improved matching of workers with jobs; better learning due to spillovers, rivalry, and again the proximity to a diverse collection of specialists (Duranton and Puga, 2004). As long as productivity keeps ahead of congestion costs, the city will grow.

For the purposes of determining urban scale, as for determining wages, when we say ‘productivity’ we mean ‘marginal revenue product’. The high productivity and high pay in cities that are bases from which market power is exercised mean that the city can grow even larger before congestion costs choke off growth: one reason cities grow big is that they are centres of power (Sassen, 1991; Walker, 2016).

Many workers, however, are no more productive in a large city than in a small one. Kemeny and Osman (2018) find that, in the USA, following the growth of tech employment, wages in non-tradeable services affected by secondary local job creation rose only very slightly in real terms. Lee and Clarke (2019), in a similar study of the UK, find that following the growth of tech employment, wages in non-tradeable services affected by secondary local job creation actually *fell* in real terms. Both results imply a sharp rise in local income inequality, consistent with Hudson’s (2006) finding, for the UK, that the share of information economy employment in a city is closely related to income inequality (in contrast, productivity growth in manufacturing both raises local average incomes and reduces local inequality: see Hornbek and Moretti, 2019). The upshot, in the wealthy technology clusters, is housing crisis and growing homelessness (Rodríguez-Pose and Storper, 2019).

Our second question concerned the damage from information-based monopolies in general. This is a complicated picture. The pharmaceutical company, exploiting a limited-term monopoly on a particular drug, harms consumers through monopoly pricing just as described in textbooks. Google and Facebook, on the other hand, provide services free to consumers. Who is harmed? These companies make money by selling advertising, a business they can dominate because they have access to a huge number of customers and because they have unparalleled information about those customers. The advertising cost is absorbed invisibly into prices consumers pay, with an overall

effect that is difficult to measure, though the effective duopoly on Web advertising presumably raises price. The more obvious damage is to competing advertisers, such as newspapers (Fox, 2019), and the effective abandonment of local news reporting (Jennings and Rubado, 2019). Where Google and Facebook (and before them, Craigslist) destroy newspapers, Amazon exploits its control of both supplier and customer information to optimise its own prices and product lines, at the expense of the independent suppliers. Since the adoption of Bork’s (1967) doctrine, damage to suppliers is not seen as an anti-trust problem by US courts. The damage to consumers, the new standard for regulation, is more difficult to discern: the fundamental problem of determining consumer harm is to know the counterfactual—what the alternative is. Today we deal with electronic networks, but networks are as old as humanity, as old as marketplaces and trade routes; trading systems often have “natural” choke points, at which princes or corporations will attempt to convert gains from trade into rents. Every marketplace, or trade route, offers consumer benefit and can be taxed whether by the state, by gangsters and pirates or by corporations; even with the tax, consumers are likely to be better off with the marketplace or trade route. The question is not whether it should exist, but whether there is a better way to govern it.

In Microsoft’s Office, we see a network that joins customer to customer. It is often thought that Microsoft owes its continued dominance to intellectual property protection, but this is so only in the most trivial sense: what links customers is *not* the complex code that makes Microsoft’s products run nor is it the user interface so important to your experience at the keyboard or lectern: it is the small but strategically crucial matter of the specifications for the formats in which documents are saved. For several years in the 1990s and 2000s, Microsoft fought regulatory battles around the world to forestall requirements that public records must

be saved in standard and non-proprietary formats; their victory in those battles is the basis of their monopoly.

The network products of both Amazon-type platforms and Microsoft's general-purpose software are a particular type of information product, which is to say products based on replicable code, so that marginal production cost is very low. Some forms of digitised entertainment—movies and music—are information products but not network products, because their network properties—the interface standards they use—are open. We can, in a more general sense, talk of the information content of a product—the share of its production cost that is the fixed cost of creating the replicable code; pharmaceuticals, genetically modified organisms and commodity microchips are all products with high information content. Companies selling information products typically rely on intellectual property (IP) protection.

In all these cases—information products generally and digitally enabled networks, platforms—extreme increasing returns are often understood as creating a natural monopoly. These increasing returns, however, depend also on institutional arrangements that favour monopoly (Guy, 2007). Khan (2017) notes that earlier generations of network monopoly, such as railroads, were required to act as common carriers, neither competing with nor discriminating between shippers, and that the principle could also be applicable to Amazon. The strength—breadth, duration and associated entitlements—of intellectual property rights is always contested: while much of Disney's oeuvre is borrowed from the Brothers Grimm and others, its own copyright on Mickey Mouse is seemingly immortal (Lessig, 2004); rights to the use of genetically-modified seeds are now enforced strikingly in favour of the rights holders, but a good case can be made for treating them as *de facto* essential standards, and thus subject to reasonable and non-discriminatory (RAND) licensing (Vacca et al., 2014).

In addition to the harm monopoly control of a market brings to individual consumers and businesses, monopoly exacerbates inequality of income (Khan and Vaheesan, 2016) and wealth (Commanor and Smiley, 1975). Eggertsson et al. (2018) find that, between 1980 and 2016, financial wealth increased rapidly despite no real increase in the amount of investment in the economy; the average rate of return on capital has stayed steady while interest rates have dropped. The financial value of many firms is now permanently higher than the cost of their assets, due to investment in intangibles, such as product differentiation, branding and advertising in order to maintain market share—a particular type of rent-seeking behaviour. Despite higher profits and lower interest rates, firms have perversely not invested in either their own operations or workforces (Lazonick, 2014; Lazonick et al., 2013).

Now to the third problem: this economic development model cannot be emulated by the places left behind. Indeed, agglomerations of information-based monopoly actively hold other places back in three ways: by appropriating revenues that are effectively a tax on almost all business activities in most parts of the world; rent-seeking behaviour restricts the flow and use of basic knowledge, thus degrading capabilities; and the high-profit margins associated with monopolies absorb capital which has been bled from the left-behind places.

In the early twentieth century, innovation in electric power distribution and telecommunications created monopolies, and government intervened to regulate these new networks (Hughes, 1983; Wu, 2018). While today's digital networks present some of the same issues, the geography of networks has changed, along with the locus of regulation and the impact of politics. When the network is a grid for the distribution of electric power, the geographical scope of the monopoly is approximately co-extensive with the monopoly's physical assets and places of employment and may be regulated (or owned) by a state or local government. For much of

the twentieth century, a distinction was made in the USA between local and long-distance telephone services, which were regulated differently—and the state regulatory bodies kept local calls very cheap. Today's information-based monopolies project market power over much wider—often global—territories; to their home bases, they represent valuable export industries, thus their home governments have little motivation to regulate them (Iammarino, 2018).<sup>7</sup>

Information-based monopolies are collecting rents—effectively taxes—based on the global distribution of their products just as ancient empires exacted tribute from distant provinces and returned it to their capitals. The apps on your phone may come from many suppliers, but either Google or Apple is getting its cut, wherever you are. Farmers the world round pay Monsanto (now part of Bayer) for each seed they plant, using and re-using the same patented genetic code (Mitchell, 2014). Booking intermediaries such as Airbnb, Trip Advisor, Booking.com and Expedia (Microsoft, again) take 15%–25% from the provision of lodging by hundreds of thousands of independent operators around the world. Companies that once bought advertising from local newspapers now buy it from Google or Facebook, which may, in turn, distribute it through the online version of that same newspaper, but having again taken a generous fee: in 2017, 61% of Web advertising revenues globally, and 25% of *all* media advertising revenues, went to Google or Facebook (WARC, 2017). In spatial terms, this redistributes wealth from around the world, to the shareholders and employees of the information-based monopolies—disproportionately found in a few privileged places.

The control of market entry exercised by monopolies affects us not only in our roles as customers or suppliers but also in our roles as potential producers. Computer software is the ubiquitous tool of the modern age; millions are urged to learn to code, and shortages of coders

are proclaimed (Cappelli, 2014), but the barriers to entry in the software market serve to discourage the use of programming skills. This includes both the barriers already discussed above, and the fact that the products of companies such as Microsoft, Adobe, Apple and Oracle are relatively closed, inhibiting customisation.<sup>8</sup> In every town, every business and every government office, this limits the ability of technical staff to customise the software products they use. It is hard to overstate the implications: not only is adapting software to an organization's own purposes locally based on skilled work, but it also develops a product and capabilities that can be sold to others. The mechanisms that ensure the continued monopoly position of a company such as Microsoft concentrate the adaptation of software both organisationally and spatially (Raymond, 1998; Stallman, 1985).

The interaction of monopoly with institutions of education and research further limits access to knowledge and capabilities. Scientific knowledge is spatially concentrated (for example, Audretsch and Feldman, 1996; Feldman and Florida, 1994). A decentralised university system has been a long source of American scientific leadership, with research universities located in every state. Previously, the best students in the heartland would attend local universities. Increased income inequality and the concentration of highly paid jobs in particular regions have combined to draw the best students towards a more selected group of universities, disproportionately located in or near the technology, finance and government clusters on the coasts (for the UK, see Faggian and McCann, 2009; for the USA, see Fallah et al., 2013). A particular strain of platform monopoly enlarges this gulf: commercial academic publishers use the power of their platforms to exact high prices for journals, putting the latest research results beyond the means of small, poor or remote colleges and universities (to say nothing of independent scholars and public libraries). The universities

that can afford comprehensive access to recently published scientific research are thus disproportionately in the same technology or financial centres as the monopoly companies: such spatial coincidence characterises many global cities such as New York or London (for example, [Beaverstock and Smith, 1996](#)). Due to the decentralised nature of university research, there remains commercialisation activity and venture capital investments in some high-growth startups in university towns around the USA but still, 40 years since the Bayh-Dole Act of 1980, there has been limited job growth and widespread prosperity as a result of these efforts.<sup>9</sup> The geographical concentration of research further disadvantages companies that are not located near a leading technology-university cluster: [D'Este et al. \(2013\)](#) show for the UK that firms located outside of such clusters actually depend more on *nearby* universities when they form research links.

And, finally, finance: growing monopolies, and start-ups that are prospective monopolies, represent investments with high expected returns; the financial sector facilitates the movement of capital out of firms with lower returns (that is, firms operating in more competitive markets) and into firms with monopoly power or monopoly prospects. Many platform companies continue absorbing large amounts of capital long after the start-up phase. Opportunities for investment in monopolies and potential monopolies bleed capital out of *places* that have relatively weak monopoly presence. Capital, however, does not always move easily. In the period since 1980, financial sector actors, such as banks and private equity, have enjoyed great enhancements to their ability to extract resources *out* of firms that do not have monopoly prospects and to channel it to ones that do. How this comes about is tied up with liberalisation of the financial sector, which has occurred in parallel with the relaxation of anti-trust rules and with the deregulation of industry. We provide detail in the next section.

### Finance: feeding monopoly, holding others back

As recently as the 1970s, the typical medium or large American firm was largely self-financing: it paid a bit of its cash flow out to shareholders as dividends and used the rest for capital expenditure. Most of the capital expenditure was financed internally and high levels of borrowing or new issues of stock were rare. When a firm's cash flow and capital expenditures were in balance, financial sector actors—banks, minority shareholders and so on—had little influence over how a firm conducted its business.

Today, the typical publicly held firm pays out substantially more of its cash, whether in dividends to its shareholders or for acquisitions of other firms. Also, again compared with the 1970s and 1980s, it is far more likely that a firm will *either* require substantial new financing for its capital expenditure *or* devote only a small fraction of the cash it generates from operations to capital expenditure. The result is greater interactions with financial market. Before we say more, let us first take some measurements.

Following [Rajan and Zingales \(1998\)](#), we define the imbalance between a firm's cash flow and capital expenditure as *financial dependence* (FD), the absolute value of:

$$\frac{(\text{Capital expenditure} - \text{cash from operations})}{\text{Capital expenditure}} \quad (1)$$

In other words, large positive or negative values of (1) indicate engagement with—dependence on—the financial sector. When the numerator of (1) is positive, the firm's capital expenditure exceeds its cash flow from operations; unless it has accumulated liquid assets in earlier years, the firm must obtain additional funds from the financial sector. When the numerator is negative, the firm is generating cash in excess of its capital expenditure; this again brings it into engagement with the financial sector, as the firm makes discretionary payments to shareholders

in the form of dividends, invests in financial assets or acquires other firms.

In [Figure 4](#), we examine the 3000 largest non-financial firms, as defined by sales, in the Compustat database in each year from 1971 to 2018. We rank these firms by FD. In the first panel, we plot, for each year, three points from the distribution—the 20th, 50th and 80th percentiles in the distribution of firms. In the second panel, we plot FD for the firms at the 90th and 10th percentiles—these more extreme percentiles are graphed separately for reasons of scale.

We see in the first panel of [Figure 4](#) that, prior to the year 2000, the median firm in this sample was self-financing, with modest payouts of less than its capital expenditure. Between 2000 and 2002, payouts from the median firm rose. From 2000 onwards, but with a surge in 2009, following the financial crisis, payouts are approximately equal to capital expenditure ( $FD \approx -1$ ).

Even more striking is the increased *dispersion* of FD among firms, the rise of FD (positive or negative) in the tails of the distribution. Before 2000, the firm at the 20th percentile of FD had cash flow of three times its capital expenditure ( $FD = -2$ ); from 2002 onwards that figure is five times ( $FD = -4$ ). Looking to positive values (capital expenditure > cash flow) of FD for the 80th percentile of the distribution, the change is less dramatic and more obviously affected by movements in financial markets (the burst of the dot com bubble in 2000–2001; the financial crisis of 2008), but the trend is upward. This picture is confirmed when we look further out in the tails (10th and 90th percentiles).

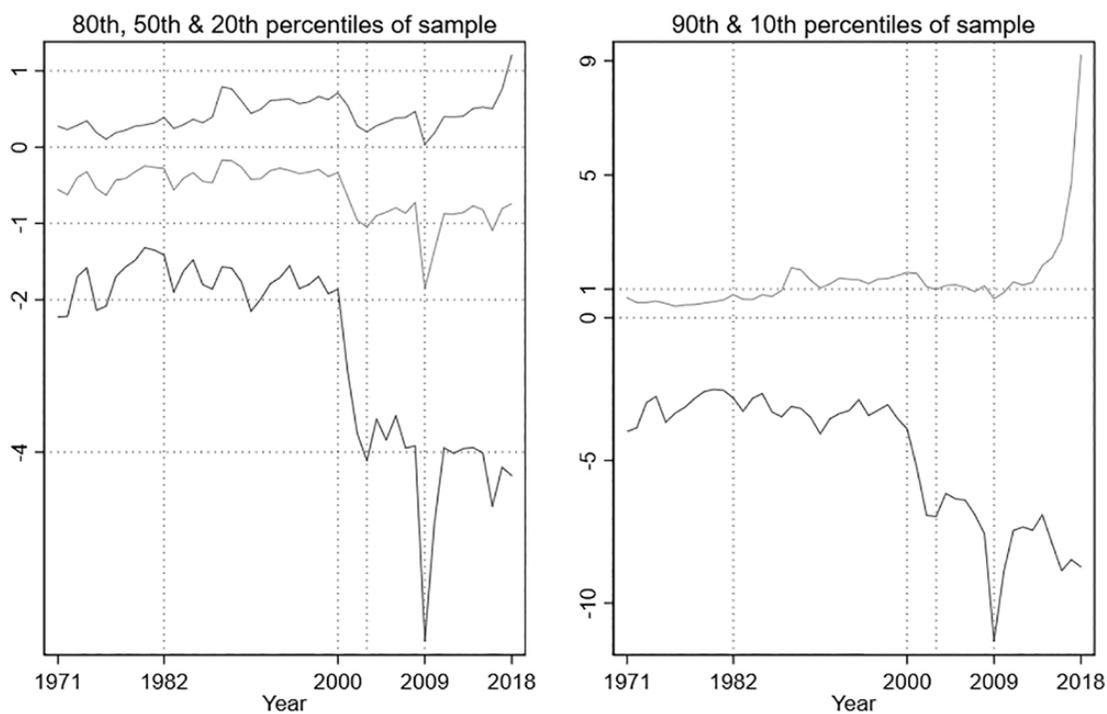
Where this aggregate outflow *goes* is of course a question: it might be, for instance, to firms not in this sample because they are privately held or foreign. Alternatively, the outflow may go to consumption by shareholders. We cannot know that from this sample. The point to bear in mind is that greater dispersion of FD, positive and negative, means a larger role for the financial sector. Because positive and negative FD

are different, there is no reason to expect positive and negative values to be symmetrical in terms of their impact on firms. Nonetheless, the growing departure from self-financing ( $FD = 0$ ) is usefully illustrated by plotting the median of absolute values of FD for each year ([Figure 5](#)).

Normative financial economics has regarded the rise of FD as a good thing. To understand the connection between finance, monopoly and disinvestment from the left-behind places, it helps to start from the arguments in its favour. Increased FD is taken as an indicator of the increased efficiency of financial markets, better fulfilling their role of enhancing the overall economic efficiency by moving the capital from less productive to more productive uses ([Rajan and Zingales, 1998](#)).

This constructive role for FD can be conceptualised in two distinct, but complementary, ways; we will call them financial development and agency, respectively. The financial development view is that FD increases when capital markets become more efficient. We assume that the firm is profit-maximising; improved efficiency of financial markets lowers the barriers to the firm's *use* of the financial sector either to increase capital investment or, in the absence of profitable internal opportunities, to redirect free cash flow (that is, any cash or assets that can be converted to cash to get a higher return elsewhere) to financial markets and thus to fund investment elsewhere.

The agency view sees a conflict between the interests of the firm's insiders (in the simplest version, managers) and external financial claimants (shareholders and creditors). Insiders want to keep resources in the firm, to make it grow, so they pay out as little as they can without inviting the intervention of outsiders; they also want to maintain their control of the firm, so they do not take on too much new financing, as that would empower the outsiders who were providing the new capital. In the agency view, then, the self-financing firm was a managerial firm ([Baumol, 1959](#); [Berle and Means, 1932](#); [Marris, 1963](#); [Penrose, 1959](#)), and managerial firms were a problem ([Fama,](#)



Statistic is  $(\text{Capital expenditure} - \text{Cash from operations}) : (\text{Capital expenditure})$   
 US non-financial public corporations; 3,000 largest, by sales, in each year

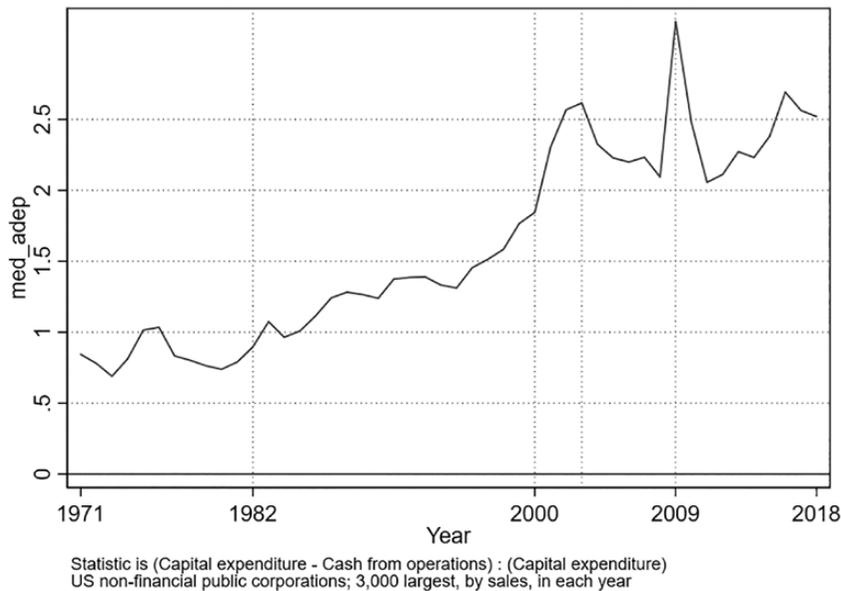
**Figure 4.** Growth of Financial Dependence Source: authors' calculations from Compustat data.

1980; Jensen and Meckling, 1976; Manne, 1965). In the agency view, increased engagement with financial markets indicates that the power of outsiders, and their ability to monitor corporate managers and to *enforce* the payout of free cash flow has grown.

Market power is absent from both the financial development and the agency views as typically formulated: the proposition that efficiency is enhanced by firms to disgorging free cash flow (whether in profit-maximising duty or due to the vigilance of outsiders) assumes that the higher returns available elsewhere are higher because the capital is actually more productive in the alternative use. The implicit model is a competitive market without market power, but with variations in the profitability of firms due to differences in managerial practice, industry

life cycle or simple random bad luck. If the higher returns are instead found by investing in actual or prospective monopolies, then the mechanism describes not an efficient allocation of capital, but the stripping of assets from firms which may be perfectly viable—in the sense that they can achieve normal economic profits in competitive markets—in order to finance rent-seeking.

In line with the prescriptions of these theories, reforms between the late 1970s and the early 2000s in banking, securities regulation, pensions and corporate governance increased the influence of the financial sector over non-financial firms. In addition to the claims of economic efficiency, these changes acquired the political rationale of defending the rights of minority shareholders,



**Figure 5.** Median absolute value of FD statistic. Source: authors' calculation from Compustat data.

a constituency greatly expanded by pension reforms which shifted the retirement savings of millions into the stock market (Gourevitch and Shinn, 2005; O'Sullivan, 2001). Enhanced shareholder rights together with new liquidity in financial markets—thanks in part to the pension reforms, and later the 1999 repeal of the Glass-Steagall Act—led to the growth of leveraged takeovers. As described and prescribed by Jensen (1989), this practice has the explicit purpose of loading a firm up with debt so that its managers will be forced to pay out cash (their free cash flow), in the form of high fixed interest payments. The practices Jensen described have become the tools of the private equity trade.

For banking, it was a deliberate federal policy of deregulating banks, encouraging them to merge and take on greater risk (Blinder, 2013; Calabria, 2009), followed by the 2008 Banking Crisis where the largest “too-big-to-fail” banks were bailed out and have only subsequently become larger. The regime of high financial dependency or financialization that emerged is a situation

in which finance is *disconnected* from the real economy (Corpataux et al., 2017; and other papers in Martin and Pollard, 2017), and alternatively one in which finance *rules* the real economy, with the interests of shareholders (or often, in practice, of financial sector institutions) overriding the interests of all other stakeholders in a firm (Appelbaum and Batt, 2014; Lazonick, 2010).

Financialization can be faulted on various grounds, both of efficiency and of distribution. Our particular concerns here are its interaction with monopoly and the spatial consequences of that interaction. Over 40 years ago, Harvey wrote that “The perpetual tendency to try to realize value without producing it is, in fact, the central contradiction of the finance form of capitalism. And the tangible manifestations of this central contradiction are writ large in the urban landscapes of the advanced capitalist nations” (Harvey, 1974, 254). With a spatially concentrated monopoly, the monopoly-driven reallocation of capital accentuates the inflow of capital to monopoly firms and the places in which monopolies

invest and outflows from other firms and the places in which they are located—a process earlier described by [Myrdal \(1957\)](#). This, together with the effective tax imposed globally by the use of monopoly services, and the withholding of access to basic knowledge and tools, is the third obstacle posed by spatially concentrated monopoly to the growth or revival of the places that are *not* homes of monopoly or privileged parts of their networks.

In addition to its growing power in the affairs of firms, the US financial sector has become more concentrated, with the five largest banks increasing their share of the commercial banking market from 29% in 1996 to 46% in 2017. The consolidation of banking power has a geography as well: the reduction of financial resources for held-back places has been aggravated by the growing industrial and spatial concentration of commercial banking: between 1994 and 2018, the Herfindahl-Hirschman Index (HHI) for spatial concentration (by commuting zone) of US commercial banking grew from 0.0199 to 0.030 for deposits and from 0.0497 to 0.1150 for assets (authors' calculation from Federal Deposit Insurance Corporation (FDIC) data). The location of bank headquarters is even more spatially concentrated, while the headquarters of corporate finance are located in a few global centres.

The wages of the good jobs in corporate finance have followed those in the non-financial monopoly sectors: [Philippon and Reshef \(2012\)](#) show that during post-war decades of tight financial regulation, financial sector workers earned less than engineers with comparable educations, while in the deregulated (which is to say, financialized) market since 1980, they earn more (see also [Levy and Temin, 2007](#)). The financial sector siphons funds to the monopolists from places and firms that have been left behind, and it is paid well for its activities, maintaining metropolitan New York as a concentration of wealth alongside the Silicon Valley and other technology centres.

The relationship between monopoly and financialization is certainly correlated and discussions of causality are beyond our descriptive analysis. We do not know if monopoly power would have grown without financialization or if financialization is driven by the demand from growing or prospective monopolies. Certainly, both financialization and the growth of monopoly are artefacts of the same neoliberal deregulation agenda. These are research questions that beg for further analysis and need incorporation in the economic geography research agenda.

### Implications and conclusions

In America, it is now common to speak of Red States and Blue States as if they were natural categories. This political division reflects stark economic realities: the technology clusters of Silicon Valley, Seattle, Boston and San Diego; New York, the centre of finance; and Washington, where the rules that govern both monopoly and finance are determined; fortunate technology or finance enclaves such as Austin or Charlotte—all these are doing well. Places that were doing well in the 1980 but have since lost ground have become known as the Red States, voting in ways that seem to run contrary to their economic interest but reflecting a deep dissatisfaction with the status quo.

This divide is not an inevitable outcome of agglomeration economies or market forces but reflects the rise of monopoly, financial power and rent seeking—forces the economic geography literature seems to have forgotten. Rising populism and the revolt of places “that don't matter” ([Rodriguez-Pose, 2018](#))—places, we have argued, that are *held back*—require new solutions. Local economic development policies that focus on generating increasing returns to place, finding the right industrial niche or smart specialisation and attracting established companies or enabling entrepreneurs, have not generated sufficient results for the majority

of the population. Current strategies will seldom be effective so long as spatial income disparities are cemented by monopoly power and monopoly power is bolstered by financial power. Through product market, labour market and financial channels, monopoly conditions drain the left-behind areas of resources; the entry barriers erected by monopolies limit entrepreneurial opportunities and often pull those firms that are able to succeed away from their original location to relocate to the centres of monopoly power. Incumbent giants and the search for new monopoly business models will continue to reinforce localised external increasing returns to create superstar cities and clusters. Against these giants, it is difficult for other localities to claim any advantage.

The most urgent task for local economic development—and complementary to place-based interventions—is, therefore, at the national level. Investments made in lagging places will not have the desired effects until the 40-year rise of monopoly power is reversed and the financial sector is regulated. Breaking monopoly power, however, proves to be tricky: many of these monopolies have become sources of comparative advantage for the USA, and their interests are now the focus of its trade policy (Rodrik, 2018). The non-financial monopolies themselves are politically powerful, and their symbiotic relationship with the financial sector gives Wall Street and the monopolies a common interest in the status quo.

The joint power of monopoly and finance have been confronted in America in the early decades of the twentieth century. Efforts of US State Attorneys Generals—and of anti-trust authorities in Europe at national and European Commission levels—signal a realisation that platform business models are not a technological inevitability but are equally due to governments' failure to regulate the new networks adequately.

The degree to which a similar situation prevails in other countries outside the USA is

not clear. While De Loecker and Eeckhout (2018) do find rising market power over the same period in OECD countries, the USA has a unique concentration of tech-monopolies. The role of the financial sector differs greatly between countries and among the varieties of capitalistic systems (Hall and Soskice, 2001), as does the spatial concentration of good jobs. Yet many other countries emulate the US model, and the extent to which multinational corporations are replicating the US pattern globally still need be accurately measured. Trends indicate that this may indeed be the case.

Our future agenda is to empirically model some of the relations we describe in this paper. There is great opportunity to provide theory, empirical work and policy recommendations to address regional disparities and income inequalities. We hope others will join in the study of finance and market structure as a topic of economic geography inquiry.

## Endnotes

<sup>1</sup> We use “monopoly power” interchangeably with the more general “market power.” This is partly on the familiar grounds that no monopoly is absolute—there is *some* substitute for almost anything one can buy, at some price. Moreover, for many of the cases, we are interested in, a model of oligopoly is not appropriate—Google is not a member of an internet search oligopoly, it is a monopoly within its (very considerable) niche.

<sup>2</sup> See, among many others, Asheim and Coenen (2005), Audretsch and Feldman (1996), Bathelt and Li (2013), Bathelt et al. (2004), Best (1990), Breschi and Malerba (2005), Cooke (2001), Feldman (2003), Feldman and Florida (1994), Giuliani (2007), Giuliani and Bell (2005), Gordon and McCann (2000), Hirst and Zeitlin (1991), Iammarino and McCann (2006, 2013), Kamnungwut and Guy (2012), Kitagawa (2004), Markusen (1996), Martin and Sunley (2011), Maskell (2001), Morgan (2004), Piore and Sabel (1984), Porter (1998), Pyke et al. (1990), Steiner and Hartmann (2006), Storper (2013) and Uyerra (2010).

<sup>3</sup> SBTC has never been a complete explanation for changes in the distribution of earnings: there is plenty of evidence for the contributions of changes

in the demand for skill due to globalisation (Autor et al., 2015; Ebenstein et al., 2009; Houseman, 2007); for the effect of institutional changes, such as those in the minimum wage, tax rates, regulation of industries and the rights of unions (Atkinson, 2000; DiNardo et al., 1996); and for power-biased technological change, due to the role of new technologies in the surveillance of workers and the planning of work (Guy and Skott, 2008; Skott and Guy, 2007).

<sup>4</sup> Some of the best evidence for the effect of market structure, rather than SBTC, in the determination of high wages comes from the financial sector. Philippon and Reshef (2012) show that prior to financial deregulation, workers in corporate finance were paid less than engineers with comparable levels of education; following deregulation, the workers in finance were paid more. They document this relationship between deregulation and the relative pay of financial sector workers from before the Wall Street crash of 1929, up to the 2000s.

<sup>5</sup> Note too that if locating a firm—or the headquarters and advanced technological operations of a firm—within a cluster gives access to the best-skilled labour, it is at the cost not only of the premium for the cluster location and cluster wages but also of forgoing the benefits of labour market monopsony that could be realised by locating outside such a cluster. Azar et al. (2018) show that, in 2016, a majority of US local labour markets could be defined as highly concentrated, with a few employers dominating local demand for workers. This employer concentration dampens wage growth (Benmelech et al., 2018). The increased control of employers over wages is accentuated by low and declining national rates of unionisation, regulation of labour market by states and/or localities and the fact that places can engage in a “race to the bottom” in terms of labour standards so as to attract inward investment (Feldman, 1994; 2003; Peck, 2001).

<sup>6</sup> The value of locating in a cluster in order to participate in the acquisitions market contrasts with Klepper’s (2011) account of the origin of clusters—including the Silicon Valley—in which a large role is played by established firms inadvertently seeding new firms, sometimes the simple result of disagreements within the established firm. These stories are not, of course, mutually exclusive.

<sup>7</sup> We focus in this paper on information-based monopoly, because of its clear association with technology clusters. The goods and services sold by these

monopolies can be classified as *tradeable*—they are sold largely outside of the company’s home base and can be counted as an export product. When we consider the relationship between monopoly and left-behind places, however, we should not ignore monopolisation of non-tradeable services. Here, the companies involved are not ICT companies, but other service companies using ICT to achieve economies of scale. Hsieh and Rossi-Hansberg (2019) decompose changes in the concentration of US industries between 1977 and 2017. They find no increase in concentration in manufacturing and little in utilities but large rises in concentration in retail and wholesale trade and other services. The growth of large retail and service firms is almost entirely due to their expansion into new geographical markets. Hsieh and Rossi-Hansberg argue that this growth was made possible by the adoption of new ICTs, facilitating management control over a large number of dispersed establishments. The growth of chain restaurants and the dominance of retailers, such as Wal-Mart and CVS, provide examples of this corporate domination of local markets in non-tradeable services.

<sup>8</sup> Ironically, the tech giants themselves depend heavily on open-source software; when they use it in consumer products—as in Google’s Android or Apple’s iOS built on Linux and BSD Unix, respectively—the strategy, always, is to lock them down to keep control of the market.

<sup>9</sup> Perversely, the Bayh-Dole Act of 1980 has the effect of financializing new discoveries and increasing competition among universities (Eisenberg and Cook-Deegan, 2018).

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