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The Big Techification of Everything

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Introduction

A few months into the pandemic, Naomi Klein (2020) noted how a tech-driven 'Pandemic Shock Doctrine' was shaping up under conditions of lockdown and social distancing. In the US, Microsoft founder Bill Gates and former Google executive Eric Schmidt were invited by New York governor Andrew Cuomo to discuss the digitization of state functions in order to tackle the corona crisis. In the UK, Big Tech companies were invited to Downing Street to discuss the solutions required to overcome Covid-19 (Volpicelli 2020), seeing the surveillance giant Palantir earn lucrative contracts to streamline data flows across the state. Meanwhile, ministers from France and Germany lauded the launch of cloud computing strategy Gaia-X, which was designed to enhance 'digital sovereignty' across the European Union, but which in reality gave front row seats to the usual American Big Techs (Fermigier and Franck 2020).

Today a handful of Big Tech platforms form 'the infrastructural core' of increasingly digitized economies and societies (Van Dijck et al. 2018: 12), operating as obligatory passage points for social exchange – colonizing professional and private lives, monopolizing flows of information and communication. In the latter case, the platforms that abetted the rise of the far right in the U.S. in 2016 joined forces to banish Donald Trump from the digitized public sphere after inciting violence in Washington DC in 2020. While there are legitimate arguments for Big Techs to counter imminent political violence, these actions illustrate the mounting unchecked power these companies wield over social life.

Although there are exceptions (e.g. Birch and Muniesa 2020; Birch and Cochrane 2021), the field of science and technology studies (STS) exhibits some lacunae in engaging with Big Tech as the core lubricant of contemporary capitalism, which we seek to remedy. This paper builds off of a recent report

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(Fernandez et al. 2020), wherein we investigated the financial accounts of the world's seven largest digital technology companies, and analyzed how their respective monopoly positions are augmented and exploited through their financial operations, i.e. corporate financialization.[1] Furthermore, we tried to historicize, conceptualize and theorize the popular notion 'Big Tech', which features more prominently in consultancy and journalistic circles rather than in academia.

In this contribution, we analyze the past, present and future of Big Tech, and frame its ascendancy as a socio-technical transition, with a handful of Big Tech companies progressively becoming the infrastructural core of a new socio-technical system anchored in digital technologies, progressively reshaping economy and society (Geels 2002, 2004; Fuenfschilling and Truffer 2016). In sketching the macro contours of this transition-*cum*-system, we seek to contribute towards a more academic understanding of Big Tech. Illuminating how technological change impacts the material artefacts structuring social life, gradually giving rise to path-dependent processes of institutional change, studies on socio-technical transitions and systems build on insights from STS, and here we seek to illuminate how Big Tech has 'disrupted' and transformed various dimensions/material aspects undergirding social life – not only including science and technology, but also economics, politics and culture (e.g. Araujo and Harrison 2002; David 1994; Freeman and Louça 2001).

The remainder of this contribution first expands on our notion 'the Big Tech bang', through which we analyze the historical rise of Big Tech and its role in shaping an emerging socio-technical system. Second, we move to the present and expand on the features of what we call 'the Big Tech model', which is based on generating network effects to facilitate rent extraction, and through which we understand the mounting power of Big Tech. As argued by Birch and Cochrane, STS and related fields emphasize 'the construction of economic rents – how they are made – rather than treating rents as the distortion of a naturalized competitive market' (2021: 2-3). Third, *ceteris paribus*, we anticipate the future by elaborating on what we call 'the Big Techification of everything', a scenario whereby Big Tech not only comes to rewire economy and society, but also enmeshes itself evermore closely with the state, effectively becoming the sun in the new socio-technical solar system.

Past: The Big Tech Bang

The history of modern capitalism is often narrated through cycles or waves, which are characterized by investment booms in a set of new technological innovations (see Rostow 1975 for an overview), giving rise to novel socio-technical transitions and systems. The late nineteenth century, for example, saw massive investments in US railroads and the rise of monopolies in banking, oil and steel (Lamoreaux 2019). This development saw the so-called 'Robber

Barons' – including John P. Morgan, John D. Rockefeller and Andrew Carnegie – accumulate unprecedented wealth in what has become known as 'the Gilded Age' (Wu 2018). In contrast, the late twentieth century gave birth to another set of innovations, this time clustered around an emerging information and communication technology (ICT) industry. These developments progressively ignited a new wave of monopoly capitalism, giving rise to twenty-first-century 'Big Tech Barons' such as Bill Gates and Jeff Bezos. The financial firepower of the captains of what might called 'the New Gilded Age' increasingly rivals that of their nineteenth-century predecessors.

Inspired by the work of Carlota Perez (2010), Figure 1 seeks to encapsulate the dawn and evolution of the ICT wave, qualifying our focus on seven key Big Tech companies (Fernandez et al. 2020: 8). We subdivide this ICT wave into *stylized periods* of tech diffusion: the first is the *installation period*, heralding the ICT-driven socio-technical transition, with hard- and software developments within the tech sector, followed by a *deployment period* based on the data-driven 'platformization' of capitalism (Langley anf Leyshon 2017; Plantin et al. 2018) beyond the tech sector – seeing the socio-technical transition become a system on its own, by redefining how people and technology interact, and thereby transforming the operating logics undergirding economy and society.

Big Tech's installation period is subdivided in three phases. First, the 1970s are characterized by *hardware* developments, led by IBM as the dominant company, and with the 1971 invention of Intel's microprocessor foreshadowing the advent of personal computers (PCs) replacing IBM's expensive business machines. Two of our seven Big Tech companies were established during

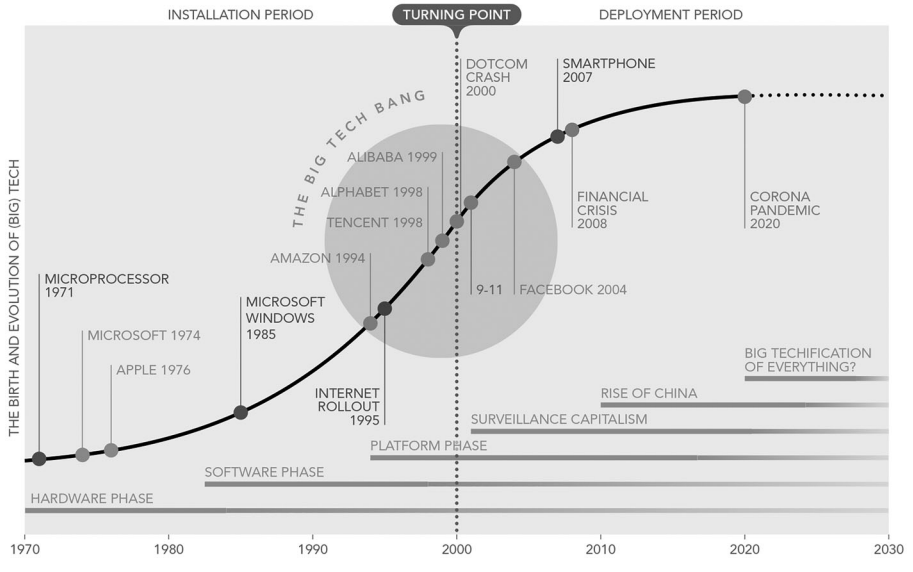

Figure 1. The Big Tech Bang (source: Fernandez et al. 2020: 13).[2]

this era (Apple, Microsoft). Second, during the 1980s going into the 1990s, the orientation in ICT development shifted towards *software* interoperability, with Microsoft taking over from IBM as the dominant company. Third, the 1990s rollout of the internet heralded the age of digital *platforms*, giving rise to the other five Big Tech companies (Alibaba, Alphabet/Google, Amazon, Facebook, Tencent), constituting a 'Big Tech Bang', whilst the more mature tech giants Apple and Microsoft steadily reinvented themselves as digital platforms.

With the installation of our seven Big Tech companies completed around the new millennium, political and economic developments like the dotcom crash and 9/11 brought forth the age of 'surveillance capitalism' (Zuboff 2019), igniting Big Tech's subsequent deployment period, expanding its reach throughout economy and society. Amongst others, Apple's iPhone massively expanded the scale and scope for data extraction, as PCs effectively morphed into mobile smartphones, boosting global connectivity and allowing for the development of personalized applications, with mounting volumes of data stored into expanding cloud infrastructures. As Big Tech turned into 'the infrastructural core' (Van Dijck et al. 2018: 12) it is today, myriad digital platforms offering consumer services developed around it (Blanke and Pybus 2020), such as Airbnb, Netflix, Spotify and Uber, igniting novel cultures under the rampant rollout of a new socio-technical system, whilst other sectors rapidly embraced the promises of digitization, including the world of *haute finance* (Hendrikse et al. 2018).

The rise of Big Tech cannot be understood without examining the wider macro-economic and monetary context. In response to the financial crisis of 2008, for example, central banks embarked on a massive expansion of their balance sheets. By purchasing financial assets such as government bonds with newly created money, however, they drove up prices and hence put pressure on asset yields elsewhere. As a result, shares in Big Tech companies became a safe haven for investors. This trend was strengthened with the corona pandemic in 2020, driving market valuations to unprecedented highs. Furthermore, these companies could make use of the financial environment by accumulating stocks of financial assets in response to profits outgrowing productive investments, seeing the financial assets of the seven Big Tech companies' approach US $700 billion in 2020. Moreover, monetary policies also fueled an increase in corporate debt. Somewhat counter-intuitively, it was not struggling companies availing themselves of this exceptional degree of liquidity. Instead, it was the world's most-profitable and best-capitalized Big Tech companies, who then leveraged their valuations by taking on more debt. As a result, their total debt increased from virtually nothing in 2010 to almost US$320 billion in 2020. As will be discussed in more detail below, by flexing their unrivaled financial muscle, Big Techs have massively expanded their operations and kept competitors at bay.

Geopolitically, another defining phenomenon shaping the global rise of the digital socio-technical system is the emergence of Chinese Big Tech companies. This has been spearheaded by Alibaba and Tencent, followed by the likes of Huawei and Baidu, which have combined technological expansion with rapid societal deployment under strict state control (Gruin 2019). Having been nurtured by US investors (Jia 2018), these Chinese companies are increasingly challenging Silicon Valley in domains like artificial intelligence (AI) and financial technology (FinTech), resulting in mounting political and economic strife across the globe (Sharma 2020; Tanda and Schena 2019; Webb 2019). In all, these developments have propelled Big Tech's power as we know it today. In the next section we outline and expand upon these joint features in what we call 'the Big Tech model'.

Present: The Big Tech Model

While the individual business activities of the world's major Big Tech companies differ extensively – whether digitizing professional working environments (Microsoft) or retail and consumption (Alibaba, Amazon), to colonizing flows of information (Google) and communication (Facebook, Tencent) – we outline a broad generic framework relevant to them all. In essence, our 'Big Tech model' can be seen as a two-step process of (i) scaling up into a monopoly position, followed by (ii) mounting rent extraction escaping market pressures.

According to Srnicek (2016), digital platforms share four characteristics. First, they function as *intermediary infrastructures* that bring different user groups together – whether as users/buyers and developers/sellers in the Apple App Store, or as private individuals who build their own content on social media like Facebook. Second, platforms thrive on *network effects*, whereby the larger the platform's size or user base becomes, the more data, rent, and/or value can be extracted. Third, this is why platforms aim to *maximize user engagement* for the purpose of collecting data, meaning that platforms are designed to get 'users' hooked. Fourth and finally, Big Tech platforms make use of intrafirm *cross-subsidization* to expand their reach and user base. This is why the likes of Facebook and Tencent offer their services for 'free', while Alibaba and Amazon (and their financiers) have habitually accepted financial losses to increase market share, and hence network effects. Indeed, an appetite for sustained loss-making to gain market share is a defining characteristic of (aspiring) digital platforms, with the world's largest technology-focused venture capital fund – Softbank's Vision Fund – playing an important role (Boyka 2020). In contrast to short-term shareholder value orientations of the financialized company of the 1990s, today's phenomenon is what Rahman and Thelen (2019) see as the new 'patient capital' – one willing to 'lose' money in the short- and medium-term to maximize shareholder value over

the long haul. Put differently, the new patient capital anticipates and accelerates the socio-technical transition, expecting returns when scale is reached and the platform assumes a leading role within the new socio-technical system. As Birch and Cochrane (2021: 2) note:

> Big Tech ecosystems are important techno-economic sites of new and emerging forms of digital rentiership … reflecting debates in STS and cognate fields about the importance of unpacking economic rents as a form of social practice

In their own ways, the world's Big Techs have progressively come to control and operate a series of different monopolies. Although quantifying and qualifying monopoly power remains contested (UNCTAD 2018), at a general level monopoly power exists when a single corporation (or a handful of collaborating corporations) wields wide-ranging influence in specific economic domains. Such influence allows monopolies to extract significant rents, which Christophers (2019: 2) defines as 'income derived from the ownership, possession or control of scarce assets and under conditions of limited or no competition'. Google and Facebook typically extract rents through advertising, whereas other Big Tech companies charge sellers for conducting operations on their platforms, whether Amazon or Alibaba through sales commissions, or Apple or Tencent charging fees from developers for selling apps via their platforms (see Birch and Cochrane 2021 for a classification of Big Tech rents).

Overall, tech monopolies are about *control* rather than ownership, for example by becoming the foundational infrastructure within a particular sector or service, through which prices and terms can be set, markets shaped, and a company's own products or services can be promoted (Dolata 2019; Rahman and Thelen 2019). In a self-reinforcing feedback loop, digital rent extraction is augmented by capitalizing upon 'gatekeeper power, leveraging power, and information exploitation power' (Khan 2018: 331). As Rahman and Thelen (2019: 4) argue:

> [T]his 'winner take all' market dominance offers many avenues for generating returns through rents while also multiplying the number of stakeholders whose dependence on the platform makes them potential allies in efforts to defend it against unwelcome regulation. This networked dominance is what makes platform firms both a revival and a reinvention of classical monopoly concerns

What sounds rather abstract has been unearthed in a number of investigations. In 2020, the US Congressional *Investigation of Competition in Digital Markets* detailed just how 'highly concentrated and prone to monopolization' the so-called markets of the American Big Techs are (United States Senate Congressional House Committee on the Judiciary 2020: 11). By virtue of their control over key platforms and wider ecosystems, they were found 'to dictate terms and extract concessions that no one would reasonably consent to in a competitive market', and to consolidate their respective positions by ongoing

acquisitions designed 'to neutralize a competitive threat or to maintain and expand the firm's dominance' (ibid.). Similar charges have recently been leveled against Alibaba and Tencent by the Chinese government. Across the globe, therefore, the Big Tech model ultimately boils down to overcoming and escaping competitive pressures by increasingly *constructing* and *governing* 'proprietary markets' (Staab 2019).

This rise of digital monopolies invites us to rethink the logics of capitalism. On the one hand, 'there is really something qualitatively distinct about the forces of production that eat brains, that produce and instrumentalize and control information' (Wark 2019: 42). Given these distinct features undergirding the new socio-technical system, Zuboff (2019) goes as far as claiming that Big Tech has given rise to 'a new logic of accumulation' known as *surveillance capitalism*, geared toward data extraction and behavioral modification. On the other hand, however, critics argue that despite these novelties, data-hungry Big Tech companies merely augment pre-existing capitalist tendencies (Morozov 2019). What is new in the digital age is not the tendency towards monopoly, but rather the rampant 'assetization' of digital footprints, turning personal data into datasets, which Big Techs exploit in order to refine their algorithms and keep an edge over potential competitors (Rikap 2021), and sell their commercial intelligence to third-party corporate clients (Beauvisage and Mellet 2020).

To Peck and Phillips (2021: 75), placing the socio-technical system captained by Big Tech in the *longue durée* perspective of Fernand Braudel, 'the real home of platform capitalism is the zone of the antimarket, a murky but dominating layer located above the competition, where it operates as a new machine with an old purpose'. For those orbiting around the infrastructural core of Big Tech monopolies, the so-called 'cost of exclusion' (Feld 2019) for trying to evade the reach of Big Tech rises dramatically, up to the point where it is nearly impossible to stay clear of it (Foroohar 2019). Through data gathering and assetization, Big Tech not only accumulates rents but also 'intellectual monopoly power' which 'extends beyond the market and takes the form of capitalist planning of production and innovation' (Rikap 2021: 11). This gives rise to a data-driven *intellectual monopoly capitalism*, accumulating 'knowledge that was produced as a commons, but that these corporations privately monetize' (ibid.). As Rikap further argues:

> [I]ntellectual monopoly capitalism can be conceived as the stage in capitalism where capital accumulation (and distribution) is led by a core of intellectual monopolies that base their accumulation (and power) on their permanent and expanding monopoly (and assetization) of predated knowledge (ibid., p.10)

There are overlapping concepts to define this changing nature of digitizing capitalism. Birch (2020b: 3), for example, uses *technoscientific capitalism* to signify a '(re)configuration of a range of 'things' (e.g. infrastructure, data,

knowledge, bodies) as assets or capitalized property' – constituting a socio-technical transition-*cum*-system which is progressively 'underpinned by rentiership or the appropriation of value through ownership and control rights' (see also Dolata 2018). Accordingly, Birch (2020a: 10) argues that 'the entanglement of digital technoscience and capitalism has led to an 'automated neoliberalism' in which markets are configured by digital platforms'. Prior to the coronavirus pandemic, further deepening social and societal reliance on Big Tech, the political ramifications of the new socio-technical system were already becoming visible, as 'the rollout of data-driven technologies increasingly requires the rollback of liberal protections by design' (Hendrikse 2021: 84), arguably giving rise to what might be called an automated *neo-illiberalism*.

Future: The Big Techification of Everything

> The world's largest technology companies … have spent at least $264bn buying up potential rivals worth less than $1bn since the start of 2021 — double the previous record registered in 2000 during the dotcom boom (Stacey et al. 2021)

Without meaningful political interventions, the Big Tech companies forming the infrastructural core of today's digital socio-technical system are set to captain what we have called 'the Big Techification of everything' over the course of the 2020s (Fernandez et al. 2020: 14), shaped by advances in the fields of AI, the fifth generation of mobile communication (5G), and the so-called 'Internet of Things' (IoT) – connecting and operating all kinds of applications and devices in the digital economy (Greenfield 2017). Given the self-reinforcing market-conquering logics of the Big Tech model, the world's leading Big Techs will dominate the tech universe for the time being, with thousands of platforms orbiting around them, and millions of applications built on top of them – all relying on its core infrastructure and paying rents for doing so.

With each company having cornered its own monopoly whilst trying to expand further in scale and scope, Big Tech has come to colonize all kinds of socio-technical forms, if not the means of social exchange broadly defined, overlaying the ways in which people used to interact via digital interfaces. Big Techs may come to infiltrate communication (Facebook, Tencent) and information (Alphabet); work (Microsoft) and consumption (Alibaba, Amazon). In setting the standards for software toolkits (Google's Android, Apple's iOS) and programs (Microsoft's Office 365), and spearheading the development of the hardware to enable exchange (Apple's iPhone), Big Tech has become the 'obligatory passage point' for all types of exchange in the digital economy (Bassens and Van Meeteren 2015). Big Tech is at the center of a new socio-technical system, functioning as its core operating system, subjecting the rest of the world to its intrusive control drift and rent-seeking logics.

Amongst others, with the new socio-technical system anchoring the platformization of capitalism, we anticipate that scholars will increasingly direct their

attention to what might be labelled *the platform state*. Braun (2020) has studied how central banks exert power through financial markets, creating various interdependencies between public and private domains and interests. In similar fashion, the socio-technical system's infrastructural core is continuously refined through data extraction and analysis, accumulating more rent and power in a self-reinforcing feedback loop (Santesteban and Longpre 2020), augmenting the tech dependencies of states. The coronavirus pandemic has seen governments worldwide come to rely on the services of Big Tech, whilst Donald Trump's social media ban underscores the extent to which Big Tech effectively polices the digitized public sphere. That said, notwithstanding actual Palantir-powered policing in the US, we arguably need to redirect our gaze towards Beijing to fully grasp how Big Tech's infrastructural power becomes interdigitated with political control, revealing the totalitarian capabilities of the digital socio-technical system (Hendrikse 2021). This brings us to the geopolitical angle of Big Tech and the geo-economic, military and technological rivalry between the US and China, which promises to sharpen over the decade to come.

The disruptive potential of Big Tech is also visible in existing multilateral and bilateral treaties on trade and investment. Amongst others, the ways in which platforms monetize their digital operations are not compatible with the principles that were created to regulate corporations in the analogue or 'real' world. For example, Big Tech is at odds with the existing cross-border allocation of tax rights, seeing Big Tech companies making extensive use of offshore financial centers (Fernandez and Hendrikse 2020). How to tax Big Tech remains subject of fierce diplomatic contestation, although the recent G7 agreement on a global minimum tax for multinationals offers a glimpse of what might be underway. The speed at which the new socio-technical system has developed into a focal point on the stock market, in political communication, in geopolitics and daily life sharply contrasts with the much slower pace at which political institutions and civil society have been able to grasp the transformative nature of these companies. Big Tech's opacity has so far provided it with an advantage and left regulators to play catch-up. However, on both sides of the Atlantic, not to mention China, we are now seeing signs of change.

Lawmakers are seeking to rein in the mounting power of Big Tech before the socio-technical system absorbs the authority of (democratically-elected) governments. Again, these developments are reminiscent of earlier transformative epochs, not least the second half of the nineteenth century. Back then, new means of transportation and communication came to remodel the socio-technical system of yesteryear, in gales of 'creative destruction', resulting in excessive wealth and power in the hands of the so-called Robber Barons. Then, as now, existing regulations failed to counteract this new tech-driven regime centered on monopolies, sparking a popular backlash bringing the Gilded Age to an end. As such, the past also suggests how to approach the Big Tech Barons

of today's New Gilded Age, which at minimum requires a serious update of the outdated competition and tax policies to rein in Big Tech.

Our societies urgently need to reflect on the possible ways in which we can rein in the looming 'Big Techification of everything', going beyond free-market imperatives to break up the Big Tech monopolies, or simply break open their data treasure chests. We need to contemplate the ways in which consumers or users might reclaim ownership over data as citizens, ideally short-circuiting the core operating logics of surveillance capitalism: one way might be to embrace open source solutions to circumvent Big Tech enclosure; another way is to take the infrastructural core of Big Tech into public hands altogether, recognizing them for the crucial public utilities they are. In any case, we urgently need to come to terms with the ways which Big Tech has come to captain the socio-technical system of our age, and consider rewriting its codes to appropriate its spoils for more meaningful ends.

Conclusion

This contribution has sought to trace and qualify the rise – past, present and future – of Big Tech, framed and understood as a socio-technical transformation-*cum*-system. First, we sketched the beginnings of the socio-technical transition, culminating in 'the Big Tech Bang' at the turn of the millennium, giving birth to what today are the world's leading tech companies. Next, we sketched the contours of 'the Big Tech Model' undergirding the new socio-technical system, based on generating network effects to facilitate rent extraction, whose logics have since spread throughout economy and society, transforming pre-existing industries, products and services, as well as their underlying socio-technical practices and structures. Without meaningful change, we subsequently argued that the intrusive control drift and rent-seeking logics driving the new socio-technical system will lead to 'the Big Techification of everything', invoking dystopian prospects, and reflected on possible avenues to halt this development.

Notes

1. We selected the world's leading Big Techs on the basis of their market capitalization in December 2020, resulting in seven leading Big Tech companies, five of which are headquartered in the US, Alphabet (Google), Apple, Amazon, Facebook and Microsoft, and two in China, Alibaba and Tencent (Fernandez et al. 2020: 8).
2. We are indebted to Michiel van Meeteren, who sketched the original contours of this figure.

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