Disruptive data: historicising the platformisation of Dublin's taxi industry

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ABSTRACT

Social and economic change in the built environment is increasingly driven by processes of datafication. These often find expression through smart phone apps and private platforms that seek to upset the status quo by mediating consumer and producer interactions, and by monetising the data these produce. This paper uses the practice-oriented concept of 'disruptive data' to draw attention away from specific technologies and towards the broader political economic logics that underlie them. In so doing, disruption is reframed as a capitalist strategy for creating and capitalising on uncertainty. The rapid change to Dublin's taxi industry over the past decade illustrates these dynamics. By following how ride-hailing apps, most notably Hailo, were introduced into and effected the city, the importance of regulatory context but also wider flows of data and capital are stressed. Data disruptions occur not at the level of the app or platform, but at the economic relations in which they are embedded. By paying attention to the historical details of data disruption, the specificities of change processes are revealed without losing track of their broader economic function.

POLICY RELEVANCE

This research will be of interest to policymakers for explaining local-level innovation. The dominant narrative of disruption presents innovation as a technology-driven change process, dependent upon individual brilliance and breakthrough. However, what occurred in the Dublin taxi industry does not confirm this narrative. Instead, the Irish government regulated the market of drivers, and the infrastructural limits of the bus and taxi lanes encouraged some ride-hailing apps while discouraging others. This tight coupling between technology and its context is indicative of a change process of continuation rather than disruption, which is more amenable to government steering. Disruption certainly did occur in Dublin, but not as a result of individual innovation. Following the ride-hailing apps past their moment of market entrance to their poorly executed attempts to scale-up reveals the corporate and financial interests that oversee and capitalise upon data disruption.

1. INTRODUCTION

Data have become a marker of the threshold of social and economic change. As a fundamental support for knowledge and decision-making, data are used to model, manage, organise, and make more efficient all manner of public and private sector operations, systems and services (Kitchin 2014), not least of which include the practices of consumer profiling and targeted advertising (Srnicek 2017; Zuboff 2019). Data and processes of datafication are a necessary precursor for the technological innovations—from smart cities to the internet of things, to artificial intelligence—that are deemed by many to lie at the forefront of capitalist development (*e.g.* Schwab 2017). As a key site of these changes, the built environment has long been subjected to processes of datafication (Powell 2014). Cities and the vehicles that traverse them are being instrumented with an increasing number of sensors and measuring devices. Citizens too have come to play important roles in sensing the city in terms of both the tracking and the recording capabilities of smart phones, and in the work performed in producing, selecting and curating data about urban environments (Gabrys 2014). Broad interest in and development of smart cities and urban platforms has further spread and intensified these changes (Hodson *et al.* 2021).

This paper contributes to theorisations of social and economic change enacted through urban datafication. It does this by understanding change not only as something that happens, but also as something that happens to something that already existed. The concept of 'data disruption' is advanced to draw attention away from the latest technology and towards the conditions under which longer processes of datafication occur. Put differently, what is new here is an appreciation of the presence of the past in data's present.

But why approach disruption through the paradigm of data rather than digital technology? Would it not be more accurate to say that it is the smart phone that has disrupted the built environment and its mobility patterns? The problem with foregrounding the role of the app or the smart phone is the same problem that troubles all efforts to explain history through the lens of technological change: a blindness to the social forces that condition the possibility for that change to occur. More important than specific apps, platforms or infrastructures are the logics, practices and processes through which they are brought about. This entails a shift in perspective from the technical to the social, from the specific to the more structural, and from the imminent to the historical. Following on from this, data disruption is positioned not as an outcome of entrepreneurial spirit, but as a capitalist process of creating and capitalising on uncertainty.

As such, rather than understand data primarily as a digital record of information, or in terms of the physical infrastructure required for its storage and communication, datafication is also used to refer to the hybrid social, technical and financial practices that allow data to be manipulated and acted upon at an accelerating pace (van Dijck 2014; Mejias & Couldry 2019). This encompasses the imperative for ever more to be sensed and stored. Data are often amassed by companies without a clear and specific purpose; it is data for their own sake (Fourcade & Healy 2017). The approach taken to datafication is a conscious move to consider data in terms of meso-level political economic logics and processes, rather than as an object or constellation of relations.

The importance of social and historical context to the occurrence of data disruptions is demonstrated through a critical–interpretivist analysis of Dublin's taxi industry. The past decade has been a period of significant and rapid change to the city's taxi services, with a high degree of uncertainty for both drivers and passengers. This disruption has been expressed through not only technological innovation but also changes to business models, labour practices and social relations. The introduction of ride-hailing apps, most notably Hailo, have initiated a platformisation of taxi transportation, with privately controlled multisided markets being established to mediate between drivers and passengers (van Dijck 2013). This has altered the way that people engage with taxis, how the industry is organised and the economic relations into which both are enfolded. The common narrative that would position this change as having been brought about by a singular innovation is resisted, and instead is theorised as a data disruption underscored by political economic processes and logics.

The paper is structured as follows. Following this introduction, which has described the problem and the perspective adopted towards it, the theoretical framework is further elaborated. An overview of the ideology of disruption is presented before the term is reappropriated to refer to higher level change processes. How this frames the crucial logics of datafication, and the relationship between platforms and the built environment then follows. In the third section, the datafication of the Dublin taxi industry is analysed. Given the importance to the proposed methodology of the context in which data disruptions occur, this is necessarily empirically detailed. However, by moving back and forth between the illustrative example and an interpretation of what it means, due emphasis is placed on broader processes and outcomes. The story of data disruption in Dublin is told in three steps: (1) deregulation and partial re-regulation that encouraged the formation of a market of individualised drivers and radio companies; (2) the introduction of ride-hailing apps and the rescoping of taxi monitoring and control mechanisms; and (3) the integration of personal data profiles and practices into global information and capital flows. Finally, in conclusion, the argument is summarised and the frame of data disruption returned to, with reflections made on what is revealed and what is gained by approaching change in this way.

2. DISRUPTION, UNCERTAINTY, OPPORTUNITY AND CONTROL

Nowhere is the ideology of disruption more evident than in the hyper-individualist culture of Silicon Valley, where Mark Zuckerberg's motto of 'move fast and break things' is applied to everything from software development to organisation management, to engagement with the law. Uber epitomises this. Founded in 2009, Uber expanded quickly with operations in 35 cities by 2012. The amount of money it was able to attract for such a young company is astonishing. Upon its launch in Dublin in early 2014, a round of fundraising valued Uber at over US$18 billion (*Irish Independent* 2014). Perhaps more than any other ride-hailing app, Uber gained notoriety for aggressively undermining existing labour practices and flaunting local laws (Dudley *et al.* 2017). Former Uber chief executive officer Travis Kalanick was well known for his ruthless attitude and abrasive leadership. But as often as he attracted criticism, he was also admired, with one entrepreneur saying:

> As a woman I think he is disgusting. As a founder, the truth is I'm like DAMN. That guy is willing to do whatever it takes and I have a mild amount of envy that I'm not a shittier human willing to go to those lengths to be successful.
>
> <div align="right">(as quoted in Rosenblat 2018: 190)</div>

Disruption is a common way to refer to the rapid social and economic change brought about by digital technologies. Promoted by magazines such as *Forbes*, *Fortune* and *Fast Company*, it has been used to single out an artform (Vogelstein 2006), a mindset (Li 2019), even the zeitgeist of the present age (Moore 2015). Use of the term to indicate a way of doing business by breaking existing conventions appears to date to the early 1990s. An advertisement in the *Wall Street Journal* (Wells Rich Greene BDDP 1992) positions disruption as part of a creative process, signalling a debt to Schumpeter's (1943/2003) concept of creative destruction.

Building on his reading of Karl Marx's political economy, Schumpeter described creative *destruction* as an impulse for innovation, internal and inherent to capitalism, which allowed it to continue to grow despite class conflict. Rather than see this as a positive mechanism, Schumpeter expressed a concern that creative destruction would inevitably undermine the social institutions necessary for capitalism to function. By contrast, *disruption* is often positioned as something vital and replenishing. It is a force said to overturn latent inefficiencies through network effects or economies of scale (Knee 2021). Here, the economy (conflated with society writ large) improves not incrementally, nor through market dynamics of supply and demand, but through breaks prompted by innovation and creativity. Disruption is a progress narrative tied to the radical ideas and actions of a singular genius (think Steve Jobs). It is an ideology of social and economic change produced directly by technological change, with little thought given to the broader consequences (Stiegler 2019).

After widespread reports of Uber's toxic work culture and a series of sexual harassment allegations, push-back against Kalanick eventually lead to his resignation in 2017. This was compounded by ongoing concern over the speed and intensity of change being brought about by ride-hailing apps, not least that expressed by drivers, unions and lawmakers. Around the same time, it was revealed that Uber had been actively monitoring enforcement officers under the so-called Greyball program, which presented them with a fake version of the Uber app in order to avoid official action (Dudley *et al.* 2017). For many, this was a step too far. Uber has been caught in a backlash against Silicon Valley and the ideology of disruption, with worries extending from the pervasiveness and privacy invasion of tech companies to the structural impacts of Big Tech's irreverence in cities, and growing sway with policy and law makers, especially in the US.

In academia, this critical turn has found a variety of expressions, including, for present purposes, in the theorisation of platform business models and data-driven surveillance practices. For Srnicek (2017), the rise of the platform is part of a long arc of capitalist accumulation. Falling rates of profitability in manufacturing are said to have forced capitalism to search elsewhere for growth and vitality. This, along with the low interest rates and loose monetary policy that have left Big Tech flush with cash, has driven speculative investment in digital platforms that seek profit through data-driven efficiency gains. Platforms come in various types (and he classifies Uber as a lean platform that puts 'growth before profit' by wherever possible outsourcing labour and fixed capital), but all stage encounters between producers and consumers through which huge volumes of data are generated (see also Langley & Leyshon 2017). Zuboff (2019) goes further, identifying in the widespread surveillance and data monetisation practices of Big Tech (*e.g.* targeted advertising) the rise to prominence of a new form of accumulation, which she terms 'digital dispossession'. The companies that are best able to extract data, and use them to predict (and even shape) behaviour, are the very same ones that will scale and be successful. The platform is simply the most efficient way that has evolved to achieve this. While their approaches to history are different, with Srnicek giving more weight than Zuboff to the occurrence and resolution of crises of profitability, both are ambitious in their theoretical breadth and explanatory power.

And yet it would be a mistake to dismiss the notion of disruption altogether. Without forgetting the reliance of innovation on infrastructural maintenance and repair (Russell & Vinsel 2018), and long-term government investment in research and development (Mazzucato 2013), it is important nevertheless to recognise these moments of rapid change. Following Thrift (2005), disruption may be regarded in terms of the relationship between uncertainty and opportunity, such that irregularity and insecurity are read by market actors as signals of possibility—the freedom to act in an open, unregulated economy. This conceptualisation rejects the narrative of individual creative genius inherent to the popular use of disruption, but nevertheless attends to aggressive strategies to target and transgress established conventions, institutions and laws so as to create and capitalise on uncertainty. Rather than prioritise rational action and low-level agency as in neoclassical economic theory, the conceptualisation of disruption offered here is amenable with more structuralist approaches to political economic processes. It is not necessary for the individuals and companies engaged in disruptive behaviour to be the ones to reap the rewards. Rather, it is that their actions are contributing to volatile conditions considered suitable for the wider realisation of profits—often by companies backed by the same investors or under the same investment cycles (Langley & Leyshon 2017).

Data disruption attends to the meso-level of social structure, between the specific uses and functions of technology, and the general forces that drive them. It is not a grand theory of change, but a mechanism for exploring what, in a given circumstance, has affected what. Operating below but not in opposition to the theories of Srnicek and Zuboff, data disruption is well placed to reveal enactments and effects of the logics that underpin datafication processes. Two are important to the analysis.

The first is the imperative to collect and create data about how consumers relate to products and services (Fourcade & Healy 2017). The technologies that facilitate individualised tracking have their origins in government service provision (*e.g.* national identification numbers) and infrastructural investment (*e.g.* the internet). But it has been the rise of the commercial web, online shopping

and digital banking, engagement with which inevitably leaves data traces, that has allowed for the systematic capitalisation of these technologies (Larsson *et al.* 2021). Companies have come to believe that they must save and organise customer data, without any immediate need or use but rather some vague notion that it will prove its value at a later date. Data brokerage, fusion and analysis firms help these companies extract value from their data assets, in the process creating a substantial secondary market for aggregated data profiles (Crain 2018).

The second logic operates through platform business models that leverage and reinforce processes of datafication. Significant work has attended to the strategies, characteristics and economics of platforms (*e.g.* Gillespie 2010; van Dijck 2013; Langley & Leyshon 2017), and their relationship to the built environment (*e.g.* Plantin *et al.* 2018; Barns 2020; Caprotti *et al.* 2022). Concepts of platform ecosystems (van Dijck *et al.* 2018) and ecologies (Andersson Schwarz 2017) have been forwarded specifically to widen the analytical lens of platform studies. To this end, Andersson Schwarz (2017) presents a three-layer topological heuristic. At its base is a concern with specific platforms as sites of proprietary control, where users (both producers and consumers) are bound by the rules and limits of the app or application programming interface (API). Above this is a layer of connection and communication. Programmed affordances allow services to be built on top of and between platforms, and so may support the development of novel and unexpected functionality. Finally is the layer of the wider platform ecology, through which Big Tech companies (such as Amazon, Google and Facebook) operate to capture emergent platforms and guide the wider data market to their advantage. Andersson Schwarz calls this bidirectional apparatus of control, which is nevertheless generative of open-ended outcomes, the platform logic. Data disruption foregrounds the social and historical context of this dynamic, but it remains important and worth holding onto.

Other areas of study have also taken an interest in platforms. Urban scholars have brought platform studies into conversation with conceptual and analytical perspectives from their own traditions. Sadowski (2020), for example, defines platform urbanism in distinction to smart cities as a more consumer (as opposed to city or municipal government) -oriented effort to take over the operation of infrastructural services. For Caprotti *et al.* (2022), the association between cities and platforms runs deeper, with the aggregation and density of services inherent to the former being integral to the network effects on which the latter relies. Their definition of platform urbanism is generous, enveloping many of the data practices and processes inherent to urban organisation and governance. Drawing conceptual inspiration from media studies, Barns (2020) approaches platform urbanism in terms of 'ecosystems' and 'remediation', broadening the platform analytic by granting attention to the geographical and historical context in which platforms act and interact.

Also engaged at the intersection of platforms and the built environment, scholars of science and technology studies have encouraged an infrastructural turn to platform studies. For example, Plantin *et al.* (2018) propose a theoretical bifocal that adopts the historical perspective of infrastructure studies (*e.g.* Graham & Marvin 2001), while paying critical attention to ways in which the 'platformisation of infrastructure' and the 'infrastructuralisation of platforms' occur. Their point is that not only have utilities (such as water, electricity and public transport) been privatised and are now often run like digital technology companies, but also that many fundamental internet services (such as search and social media) have become a fundamental infrastructure for society. While these efforts to expand the scope of platform studies all resonate with data disruption, none does so with the same theoretical emphasis placed on processes of datafication.

3. THE PLATFORMISATION OF DUBLIN'S TAXI INDUSTRY

Since the 1990s, Ireland has strategically courted foreign direct investment through a low corporate tax rate and pro-business regulation (Stewart 2005). Apple, Google, Facebook and Twitter all have their European headquarters in the country, and Microsoft, Amazon and Intel (and many others) have a strong presence there. One of the more visible and felt effects that these economic policies have had on Dublin has been an increase in traffic. Before the 1990s, low public transport subsidies and ineffective transport planning had left the city's infrastructure in a poor state to accommodate economic growth. Car ownership, use and commute times all

increased with the influx of people and capital, which in turn affected air quality (Ellis & Kim 2001). Within this context, the taxi industry underwent a period of deregulation and expansion, which helped to fill in some of the distribution and provision gaps within the city's greater public transport infrastructure, and set the stage for the platformisation that was to follow.

The analysis presented here draws on participant observation undertaken in Dublin in late 2013 and early 2014. This was an important moment, just as Hailo had reached its ascendancy but before the influx of new apps altered and expanded urban platform services. Reflections on personal use of the app and discussions with drivers about its effects are supported by an iterative analysis of government, industry and media documents, which give context to the fieldwork and track subsequent changes to the industry. The methodology is critical–interpretivist in that it uses these materials to theorise social and economic change from the historical and political perspective of data disruption, moving back and forth between the empirical details, and the logics and processes that underlie what they mean.

The Dublin taxi industry is a good illustration of these change dynamics for two reasons. First, taxis were common and well established in the city, especially at the time that the ride-hailing apps were introduced in the early 2010s. Second, national economic policy has made the city extremely attractive to tech companies and a popular early target for the international expansion of start-ups. Together, these factors made Dublin a site of experimentation, with a mix of entrants and business models, while many strategies were still being developed. The successes and failures that make up this disruption are varied and instructive, and taken together reveal the wider trends of datafication that are sometimes obscured in the presence of a single dominant actor.

3.1 MAKING MARKETS

In their expansive social history of urban infrastructure, Graham & Marvin (2001) describe the disappearance of an infrastructural ideal. In the mid-20th century, many critical infrastructures, including roads and public transport, were run as state-regulated monopolies with the goal of ensuring the fair distribution of access. However, through a process of privatisation starting in the 1970s, these monopolies were often deregulated, split up and sold off in order to promote efficiency gains and price reductions through market competition. What was important for Graham and Marvin was that these changes allowed for variations in the quality of and access to infrastructure to increase, resulting in poor functioning services for marginalised and low-income populations. This growing inequality of provision they theorised as splintering urbanism.

Infrastructural history in Ireland does not conform to this narrative—the provision of critical services has always been uneven and of varied quality, with rural communities sometimes left to oversee necessary installation and maintenance on their own (Bresnihan & Hesse 2021). It is the case, however, especially since the early 1990s, that the Irish state has played an active role in the formation of private markets, and the commercialisation and financialisation of state-owned companies (Bresnihan 2016). This has entailed not only deregulation but also more active regulatory supports.

The Irish taxi industry was subjected to a series of regulatory modifications designed to ensure transport services through a functional but trustworthy market of providers. Until the turn of the millennium, the number of taxi licences issued by the Dublin local authorities was limited to 2800. But in November 2000, licensing regulations were lifted at the national level causing an immediate collapse of the reseller market and an influx of new drivers (Maguire & Murphy 2013). Union estimates made in 2008 found there to be a total of 19,000 national licenses, of which Dublin could claim 12,000 (McEnroe 2008).

Despite this deregulation, the state has continued to exert control over the industry in important ways. In 2006, the taxi fare system was regularised nationwide, fixing the calculation according to time and distance. Similarly, the screening and approval of drivers, conducted by the national police service, An Garda Síochána, intends to ensure accountability and passenger safety. In sum, the regulatory context before the introduction of the ride-hailing apps had helped produce an individualised market (*i.e.* not licence restricted, consortium based or heavily unionised), with

certain assurances catered by state control. Private hire vehicles (*i.e.* limousines), by contrast, were regulated through similar screening procedures, but a fare structure more susceptible to market dynamics.

For the most part, radio companies operated on top of this individualised market. Taxi drivers at this time often engaged in practices of standing for hire and plying for hire. The first requires an official taxi rank to be designated and marked out by the local authorities. The latter involves driving while looking for a fare, which contributes to traffic congestion and vehicular wear and tear, and is considered by many drivers to be inefficient. In this context, the radio companies solved the problem of connecting people in need of a journey with drivers available for hire. Bookings were made by phone to a central operator who would then deploy a private radio system to identify a driver willing to take on the job. As such, the allocation of drivers was dependent on the knowledge and social relations of the operator, and so was subject to favouritism and corruption—especially in instances where long journeys were booked well in advance. But the radio companies also required additional fixed capital and labour. In the first instance, in terms of the radio receivers installed in drivers' cars and, in the second, in the need to employ telephone operators. These costs were recouped through a charge to drivers, which they claimed to be around €5000 per year.

Despite market individualisation, social relations were fundamental to these companies, both in terms of the ties between drivers and operators, and the loyalty of customers to a familiar and often local brand. While drivers might occasionally be sent between Dublin and some of its smaller outlying towns, they were typically based close to home. Radio companies had a central office, around which their network of drivers moved, and their radio system was installed, operated and maintained. When using the service, customers were largely disconnected from the driver until their arrival, and there was a certain degree of trust that they would arrive at the correct time and place. Problems relating to the punctuality and performance of the driver were reflected onto the company and recorded at their discretion. Customer calls and complaints were to the telephone operators, who were then in communication with the driver. This in turn bound radio company employees into professional relationships of reciprocity.

The pro-market regulation of the Irish taxi industry primed the way for the introduction of ride-hailing apps and wider processes of platformisation. But the country's departure from the narrative of the loss of an infrastructural ideal also imbued it with particular structural features that would help ensure some models were more successful than others.

3.2 'THERE'S AN APP FOR THAT'™

Dublin and Ireland had already undergone considerable change in the two decades before the launch of the Apple iPhone and App Store. Smart phones and location-based apps were well placed to leverage these changes, and as such their introduction is as much a continuation of longer processes (*e.g.* of marketisation and globalisation) as a disruptive moment of uncertainty.

Hailo was co-founded in late 2011 by three taxi drivers and three entrepreneurs. It launched in London before being rolled out to Dublin in mid-2012. By the end of 2013, it was estimated to have signed on around half of the city's taxi drivers. Consumers accessed Hailo as a smart phone app designed to make booking a taxi easy (White 2016). Their location could be determined automatically using the Global Positioning System (GPS), but it was also possible to adjust the pickup point by using gestures to pan and zoom the app's familiar map interface. Once a booking had been initiated, a nearby available driver would then be notified and given the opportunity to accept. As the driver approached the pickup point, the passenger could follow their progress in near real-time, and call them directly to provide additional information about the journey. While removing the telephone operator from the booking process was more meritocratic in one sense, discrimination persisted on other grounds (principally racial) as customers were able to see a picture of their driver in the app before they arrived. In contrast to the fixed fee model of the radio companies, Hailo was able to charge on a per trip basis (initially 10% but raised to 12%), which lowered considerably the joining cost for drivers.

Other ride-hailing apps were quick to follow. Uber entered Dublin heavily capitalised in 2014, but did not offer any significant benefits to drivers or customers, and so struggled to win market share. State regulations also proved difficult to ignore. The nationally mandated fixed fare system, for example, made sure that Uber was unable to deploy its variable pricing model with taxi drivers. Uber attempted get around this by courting private hire vehicle operators to its variable pricing Uber Black service, even going so far as to pay a salary in the early months to ensure that sufficient vehicles were on the road and available for hire. Here, too, it was unable to grow at rates seen in other cities, in no small part due to private hire vehicles being forbidden from using the bus and taxi lanes to move quickly through Dublin's busy streets. Similar issues have faced companies that use non-licensed drivers (*e.g.* Lyft) as in the so-called ride-sharing model.

But not all Hailo competitors struggled. Ireland's largest taxi company, Global Taxis, with offices in north Dublin and some 1000 cars (or around 5% of the national total), developed and deployed their own app in early 2012. While cab:app was rather rudimentary in comparison with Hailo, it was later improved and rebranded as Lynk (Newenham 2015). By drawing on their existing service infrastructure and the good will of the many smaller companies that amalgamated to form Global Taxis, Lynk were able to eke out a niche as a home-grown alternative to their large international competitors. By 2015, it employed a fleet of around 2500 cars.

While not Dublin's first or only taxi app, Hailo was the first company with international economic backing to target all taxi drivers in the city, regardless of whether they were independent or signed up with one of the radio companies. In this respect, they had a first-mover advantage over Uber. But Hailo also offered a pay structure that was attractive to drivers, above all to those that preferred to work on their own. They were, as such, a significant challenge to the business model of the radio companies. To be able to match the initial 10% taken by Hailo, a radio company (charging €5000 per year) would have to offer more than €50,000-worth of business. All a licensed driver needed to be able to sign up was a smart phone, which made Hailo an easy supplement for a driver with a radio receiver already installed. Many drivers and passengers found the Hailo app intuitive to use and often more convenient than interacting with an operator. As Hailo grew in popularity through 2012–13, most of Dublin's radio-based networks disappeared, with drivers being brought into a single, much larger network. This network was more decentralised, with Hailo having their head offices in London and only support staff in Dublin.

Hailo conforms to Srnicek's (2017) definition of a lean platform. By leveraging the existing, state-funded telecommunications and internet infrastructure, Hailo operated with less fixed capital than the taxi radio companies. This translated into savings that could be used to offer enticing rates to drivers. But drivers also received new expenses and technical responsibilities. Rather than have the radio company ensure that their equipment is properly installed and in working order, drivers were required to purchase and manage their own technology (*e.g.* keep their smart phone charged and up to date, and maintain the proper accounts and payment systems). Hailo were thus able to further outsource costs by capitalising on wider processes of entrepreneurial subjectification.

Social relations within the taxi industry also changed. For example, drivers took over the role of the telephone operators. When using the Hailo app, the customer not only knew the name of their driver, but were able to track their progress and arrival in real-time. This meant that if they believed that the driver had gone the wrong way or were not progressing quickly enough, they were able to call them directly. In operating a thin service that connected passengers to drivers, Hailo avoided responsibility for poor service and the labour costs inherent to customer complaints. Any failure to perform became the fault of the driver and not the mediating partner—as it was for the radio companies. This recasts drivers as individual service providers.

The failures and successes of ride-hailing apps in Dublin were dependent on social and historical context. With a proper understanding of the industry and its regulatory framework, Hailo was able to quickly capture the market while Uber, whose model has proved so successful in North American cities, was not. While this coupling between what happened before and after suggests a change process more akin to continuation than disruption, the aggregate effect of this shift was nevertheless to introduce uncertainty. This became clear when Hailo began to scale.

3.3 SCALING-UP AND FOLDING-IN

In order to reveal the disruptive datafication that has taken place in Dublin, it is necessary to continue beyond Hailo's moment of triumph and consider the business logics it has enacted, and the wider economic processes within which it has played a role.

In 2016, following Hailo's failed entry into the North American market, German car manufacturer Daimler bought a 60% stake in the company (Lunden 2016). The good faith and strong brand identity that had been established in Dublin—it was not uncommon at that time to hear people say that they would 'hailo a taxi'—were undermined as the app overhauled its user interface and was rebranded as part of a merger with MyTaxi, another ride-hailing platform acquired by Daimler. Drivers were forced to accept a rate hike (from 12% to 15%), and users endured ongoing technical problems and the introduction of unpopular additional charges, all of which further eroded the company's market share and, ultimately, profit margins. In 2019, it rebranded once again, this time as FreeNow, in anticipation of an expansion of platform services (Weckler 2019). The app that once was Hailo is now a trans-European company with ambitions that far exceed easy taxi bookings.

The merger throes of Hailo were a moment of uncertainty and an opportunity for its competitors. Uber has grown in Dublin, albeit slowly, and other companies have entered the city's taxi market, *e.g.* the Estonian start-up Bolt (Gorey 2020). These new players offer additional services including food delivery and e-scooter hire. Customers are free to choose from a variety of apps and often need to download several to ensure they receive full coverage of services. For taxi drivers, it is not uncommon to look for work on multiple platforms at the same time—a tricky practice that requires the juggling of phones and constantly logging in and out of apps (Rosenblat 2018). As Hailo lost market share to wider processes of urban platformisation, Dublin witnessed a simultaneous service expansion and market fragmentation.

Whether or not this has improved cost and convenience, it has significantly altered data practices. As Hailo took over from the radio companies, drivers and customers were first drawn into using ride-hailing apps and then came to depend upon them. This generated a significant volume of individualised spatial and temporal data about movement patterns, including locations frequently travelled to and from, and other metadata made available through the Apple iOS and Google Android operating systems. Even if not all ride-hailing apps have the sophisticated data architecture assembled by Uber (Shiftehfar 2018), they will be impelled by the data imperative to save and store everything they can. This represents a significant departure from the piecemeal data storage and analysis practices that would have been undertaken by taxi drivers and the radio companies in the course of normal business operations. Some of the consequences of this new data-collection paradigm are apparent. For example, Uber has made available through its Uber Movement service day-by-day traffic speed data for more than 50 cities around the world (Uber 2023). This is valuable information that may be useful not only for optimising travel routes but also for urban transport planning more generally. But Uber also became embroiled in a data privacy controversy when it emerged that every one of their employees had access to their databases—and that some had even used it to predict sexual encounters (Mueffelmann 2015). But the more important point is perhaps how little is known about how user data are being commodified. As drivers and passengers engage with a greater number of platforms, they increase the risk of inadvertently sharing their personal data with non-transparent data brokers and other unscrupulous third-parties.

The data produced by urban platforms are not only used to improve transport and mobility services, but also are interleaved through an ecology of data brokerage and reuse with globe-spanning business and financial interests. All the ride-hailing, e-scooter and food delivery apps that operate in Dublin are in turn mediated by the two large app stores: the Apple App Store and Google Play Store. Thus, there is a folding of urban platforms and the spatially dispersed networks that they operate into broader platforms still. This points to the eventual use of individualised taxi mobility data in the continual refinement of consumer purchasing profiles.

The consequences of being drawn into these global capital flows are not necessarily in the long-term interest of the local taxi industry—and, indeed, go some way towards explaining the difficulties and decline of Hailo. Most of the platform companies operating in Dublin received early

investment from venture capital funds. For the portfolios of these funds to achieve aggregate returns, companies are expected to show growth potential within 10 years, following which investors look to cash-out, *e.g.* through an acquisition or initial public offering. It is the very ability of the platform to rapidly scale that makes them attractive to venture capitalists (Langley & Leyshon 2017). As such, the merger of Hailo with MyTaxi in all likelihood originated not with the desire to continue to improve taxi services in Dublin, but with investor demand for a liquidity event. To scale by whatever means and cost is the goal. The disruptive uncertainties engendered by such volatile scaling are intrinsic to platform business models.

The logics of the data imperative and the bidirectionality of platform control reveal what is at stake in the disruption of Dublin's taxi industry. More important than specific apps and platforms are the wider processes of datafication to which they contribute. These include the normalisation of services that track and manipulate personal data, the third-party aggregation and monetisation of consumer data, and the financial mechanisms that allow data-driven platforms to quickly scale and reach acquisition. In this interpretation, Hailo and the other ride-hailing apps active in Dublin are an illustrative example of the enactments and effects of the political economics of data.

4. CONCLUSIONS

As data become intrinsic to political economic forces, the conceptual and theoretical tools with which they are grasped must be adjusted. The popular notion of disruption has here been repurposed to call attention to the uncertainty as opportunity for accumulation that data logics and platform business models bring about. This is not a disruption induced by a specific technology, but rather a consideration of disruption as a capitalist technology in itself, the goal of which is to generate profit opportunities.

The disruption of the Dublin taxi industry has been analysed as three moments in a longer historical process. The first is the making of the market for the radio companies, *i.e.* the state's role in guiding their infrastructural, political and economic constitution before data disruption. The second moment is the rescoping of taxi monitoring and control mechanism initiated by data logics and processes in the form of new apps and platform services. And the third is the integration of the taxi industry into global flows of data and capital, revealed as platforms attempt to scale. To frame these changes in this way is not to tell a neat story of innovators seizing upon a market opportunity. Rather, the intention has been to approach data disruption in terms of broad forces of social and economic change.

But how much has actually changed? People still use taxis to move about the city, folding distant locations together and decreasing the amount of time and effort spent travelling in between. The taxis themselves and the roads they traverse are not in any profound way affected by data disruption. And yet, beneath the surface of appearances, the social and economic relations that intermediate taxi drivers and passengers have been completely reconfigured. Instead of relying upon radio companies to establish a connection, much of that work has been pushed onto the individual. In managing and coordinating a fare, drivers and passengers have both been reproduced as more responsible subjects. Similarly, in eroding the social relations on which radio companies were based, there is a withering of local institutions and an atomisation of the role of the taxi driver. These more distinguishable subjectivities, always connected, always sensing, in turn produce multiple and more detailed individual data profiles. The intermediating network has moved in the opposite direction, not imploding in on itself but exploding outwards. Taxi work and use have been drawn into economic processes, the objective of which is not to corner part of the market or establish a local brand, but to scale as far and as fast as possible. In this way, the data profiles produced at the micro-level are interfolded into a platform ecology geared towards the accumulation and valorisation of data on a global scale. These twin stresses transform social relations beneath and beyond the taxi journey, reconstituting it as a collection of data points to be integrated into third-party monetisation strategies, such as consumer profiling and targeted advertising.

Much of this analysis is consistent with work on platformisation and datafication. The transformation of urban transport into a domain of datafied practice supports digital platforms, defined and organised by a handful of Big Tech companies, in the aggregation and commodification of consumer profiles. In 'seeing' not only transport 'like a market' (Fourcade & Healy 2017), but anything person linked and internet connected as potentially market-engaging, the data imperative reinterprets the value of seemingly banal transactions, such as between a taxi driver and their passenger. While this capitalisation of data is intertwined with a data imperative, control is enacted through a wider platform ecology (Andersson Schwarz 2017). On the surface, taxis perform the same function for passengers that they always have, but underneath and often invisible to users, data disruption has furnished other markets (such as those for individual profiling and targeted advertising) with data collected and shared by the app, map, search engine, smart phone operating system, *etc*.

By adopting a historical perspective, attention has also been drawn beyond conventional limits of these technologies; towards those social and economic logics and relations that allow them to perform in the ways that they do. This has shown how the formation of markets for infrastructural services paves the way for platformisation and datafication. In Dublin, an established market of individualised drivers, encouraged by legal reforms to licensing, in turn allowed for the incursion of ride-hailing services that depended upon individual driver agency and entrepreneurship. Similarly, a pre-existing telecommunications and software infrastructure was necessary for Hailo to be able to bypass the fixed capital of the radio companies. But it also refers to the legal structuring of fares and road usage—that is, the Irish fixed fare system, and the fact that taxis can use the Dublin bus lanes while limousines cannot—which effectively shielded Hailo from the challenge of businesses built on lower and variable pricing models (*e.g.* Uber, Lyft). Finally, a historical perspective allows for better identification and characterisation of what is new and what has been lost. In the example of Dublin, what is new are the globalised but individualised data subjects that have come to be produced through taxi booking and driving; while what has been lost is the control that many drivers had over their own work environment, and the sociality and reciprocity inherent to their localised networks. Bringing the past into an analysis of data disruption helps fend off any tendency to prioritise and fetishise the new.

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