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Governance of urban data commons as a matter of value redistribution in the smart city

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Abstract

In today's urban environments, "datafication" of social interactions and community activities is ubiquitous and actualises in various applications. One may think of sensor-enabled urban mobility, data-driven water supply systems, innovative waste management plants, and so forth. Data-driven solutions, forming the "smart city", aim to tackle complex urban problems, and largely depend on marketising or privatising public services. Smart city models, therefore, tend to disguise processes of data appropriation by private enterprises ("data ownership"). By contrast, there is a bourgeoning legal literature exploring how decentralised data infrastructures can open up access to "urban data commons" (UDC). A growing number of public-led (eg the DECODE Project in Barcelona), private-led (eg Sidewalk Toronto in Toronto), and informal projects have put data access into practice. These regulatory schemes aim to foster data access and data sharing, but they tend to neglect the redistribution of value flowing from the positive impact of citizens' interactions and cooperation on smart city vendors' activities – what I call "positive externalities". This paper addresses the issue of data-driven value generation and redistribution in the smart city. It argues that data governance encompasses matters of both use and value that need to be addressed jointly. Therefore, it comes up with some recommendations that can help to incorporate matters of value from data-driven activities. Specifically, I seek to explore the ways to remunerate municipalities in cases where smart city vendors harness positive externalities. In doing so, I circumscribe my analysis to two solutions that have distributional implications for the governance of UDC, ie Fritz Schumacher's proposal of (large-scale) ownership in his classic Small is beautiful: Economics as if people mattered and the (IP) benefit-sharing principle as applied to indigenous communities.

Résumé

Dans les environnements urbains actuels, la "datafication" des interactions sociales et des activités communautaires est omniprésente et se traduit dans diverses applications. On peut penser à la mobilité urbaine assistée par capteurs, aux systèmes d'approvisionnement en eau basés sur les données, aux usines de gestion des déchets innovantes, etc. Les solutions fondées sur les données, qui forment une "ville intelligente", visent à résoudre des problèmes urbains complexes

et dépendent largement de la commercialisation ou de la privatisation des services publics. Les modèles de villes intelligentes ont donc tendance à masquer les processus d'appropriation des données par des entreprises privées ("propriété des données"). En revanche, il existe une littérature juridique florissante qui explore la manière dont les infrastructures de données décentralisées peuvent ouvrir l'accès à des "données urbaines communes" ("UDC"). Un nombre croissant de projets publics (par exemple le projet DECODE à Barcelone), privés (par exemple Sidewalk Toronto à Toronto) et informels ont mis en pratique l'accès aux données. Ces dispositifs réglementaires visent à favoriser l'accès aux données et leur partage, mais ils ont tendance à négliger la redistribution de la valeur découlant de l'impact positif des interactions et de la coopération des citoyens sur les activités des fournisseurs de villes intelligentes – ce que j'appelle les "externalités positives". Cet article aborde la question de la génération et de la redistribution de la valeur par les données dans la ville intelligente. Il fait valoir que la gouvernance des données englobe des questions d'utilisation et de valeur qui doivent être traitées conjointement. Par conséquent, il propose quelques recommandations qui peuvent aider à intégrer les questions de valeur des activités basées sur les données. Plus précisément, je cherche à explorer les moyens de rémunérer les municipalités dans les cas où les fournisseurs de villes intelligentes exploitent des externalités positives. Ce faisant, je circonscris mon analyse à deux solutions qui ont des implications distributives pour la gouvernance de l'UDC, à savoir la proposition de Fritz Schumacher concernant la propriété (à grande échelle) dans son classique Small is beautiful : Economics as if people mattered et le principe de partage des bénéfices (PI) appliqué aux communautés autochtones.

Keywords: Smart cities, Commons, Public space, Urban space, Community, Data, Society, Private / public

Mot-clés : Biens communs, Espace public, Espace urbain, Communauté, Smart cities, Données, Société, Privé / public

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Introduction

In March 2021, Tesla CEO Elon Musk tweeted that he planned to create a novel city in South Texas. The news quickly spread across the world and many people were taken aback. Quite unsurprisingly, he envisioned a high-tech smart city where automation and network systems lead citizens' lives and follow their own rules (Lombardi 2021). Its venture is a commentary of the ultimate technology-driven model of urban development: the "smart city". Most part of this ambitious endeavour envisages using large-scale datasets that may reveal features and behaviours of citizens and urban communities (Cardullo 2019 ; Cohen 2019 ; Zuboff 2019). Thus understood, data depicts social interactions (Viljoen 2021), forming a precipitate, so to speak, of urban cooperative webs. To be sure, utilising big data technologies in the smart city has salutary effects on people's and communities' lives. Take, for example, public transport. Busses and trams equipped with sensors harvesting real-time data make citizens' lives easier by a great deal. But the arrow of causation runs the other way as well. Overall, urban communities and citizens have a substantial positive impact on intensive data processing practices at the heart of the smart city–what I call "positive externalities" in the subsequent sections. The data produced in the smart city is a hotchpotch of "recorded abstractions" (Sadowski 2019, 2) condensing diverse urban practices, moods and lifestyles. This is the key to success for data uses.

Against this background, the data-driven activities in the smart city depend on how an agent can govern (e.g. use, grant others access and so forth) data assemblages to engage in various activities (Fia 2021). Data collec-

tion in the smart city is routinely assigned to private vendors ("smart city vendors" or "smart city contractors") by means of public procurement and, more and more often, public-private partnerships (PPPs). Municipal authorities increasingly engage in agreements with smart city contractors providing guidance on how personal data hoarded by means of smart city technologies ought to be accessed and (re-)used (Walravens et al. 2021). Municipal authorities and smart city vendors, however, tend to leave aside considerations on how urban citizens' activities positively impact data processing practices. Thus, smart city vendors can harness this data-driven value, which consists of significant economic benefits flowing from data collection.

The paper examines how data governance works in the smart city and explores how it can address the data-driven value matters resulting from the smart city vendors' processing practices that harness a positive impact generated by citizens and communities in the smart city. The remainder comes in three sections:

1. Delves into the "smart city" notion by investigating the empirical trends and delineates the operational definitions. More specifically, it looks into the prevailing model of the smart city that arises as an outgrowth of privatisation processes of urban services and provides the background for the smart vendors' activities (Cardullo and Kitchin 2019).

2. Situates data governance at the heart of the smart city and examines two main models of data governance. As will be signalled, one is about erecting barriers to data access ("data ownership"). The other one fosters data uses by making data available for multiple actors and sectors, aiming to form the "urban data commons" (UDC).

3. Explores the tools of data governance that primarily deal with the value resulting from the smart city vendors' ability to harness the positive externalities in the smart city. In doing so, it outlines some practical recommendations that can help in this respect, as other scholars have already done regarding data sharing issues (Walravens et al. 2021).

The smart city and its bits: definitions, applications and trends

Definitions

"Smart city" is a byword meaning different things. The Wikipedia definition reads: "A smart city is an urban area that uses different types of electronic methods and sensors to collect data". To define it, some scholars focus on its technical constituents (Goodman 2020, 823; Drahos 2021, 159–60). Others hone in on its socio-economic potentials and promises and view it as a way of addressing complex urban issues by means of data-intensive technologies (Caragliu, Bo, and Nijkamp 2011). Other social scientists underscore its cultural implications, signalling a shift towards an "ideal urban future which has rapidly become significant in policy and industry parlance, something more than its cables, sensors, and servers, or a combination of these" (Cardullo 2021, 15). Although there is no unique description, smart city cheerleaders typically treat the label as a "floating signifier that can change referents whenever needed, allowing for a flexible, dynamic space in which to plug a variety of products, practices, and policies" (Sadowski and Pasquale 2015). Public local authorities tend to use the term "smart city" more as a branding effort to attract million-dollar investments, seeking to swell urban coffers (Goodman 2020, 825). In doing so, some cities turn into testing apparatuses to pilot novel data technologies and appeal to the "creative classes" (Cardullo 2019, 816).

Applications

The intricacies of employing data-driven technologies in the urban context reflect a myriad of contextual applications. The smart city is not one single thing, but it actualises by virtue of various data-driven technologies. The bad and the good of things come from how one uses them, rather than how they look like by scratching their surface. One cannot label the smart city as the root of all evil without engaging in the analysis of its technological components.

There exist relatively "unoffensive" applications of the smart city. One illustration in this respect is the smart "adaptive" traffic signals connecting to autonomous vehicles in real time and regulating the traffic flow accordingly (Astarita et al. 2020). Other examples can be smart waste management and

smart lighting apparatuses. The former systems collect large-scale sets of data on waste production. The sensors of the smart rubbish skips can gauge filling level and anomalies, providing efficient collection routing based on the filling level, and therefore less citizens' inconvenience because of full or faulty bins. These systems have been implemented in Rotterdam, for instance[1]. Smart lightning systems rest on interconnected lampposts transmitting and analysing traffic data and environmental information (e.g. urban bustle, air quality, and so forth). Major European cities such as Munich, Barcelona, Rotterdam, and Copenhagen have already implemented these systems. For example, Barcelona uses smart urban lighting to govern crowds in public areas (e.g. beaches) (Diran et al. 2021, 4). Other instances of this typology of data-driven urban technologies are smart irrigation systems that automatically gauge the amount and time of watering based on the outside weather conditions; and smart urban mobility systems, as will be analysed in the subsequent section.

The other end of the spectrum comprises more "worrying" technology applications, to say the least. Some smart city applications pose ominous risks, grounding avant-garde technological forms. This is the case of CCTV systems equipped with facial recognition technologies that some municipalities have installed in bustling spaces for law enforcement purposes (Financial Times 2021).

In between the two ends of the spectrum, we can single out applications in which drawing a line between the good and the bad is more controversial. Some smart city applications can direct and nudge individuals into prearranged activities and behaviours (Ranchordás 2020, 254; Yeung 2017, 118). Nudging practices frequently aim to prompt urban citizens into sustainable and eco-friendly attitudes. Smart navigation devices, amongst other things, can suggest the least congested route to prevent traffic jams or recommend using less polluting transport services (Franke and Gailhofer 2021, 2). For example, in Durham (North Carolina), commuters are nudged into preferring public transport means over their private vehicles. The municipal authorities deliver personalised route indications from houses to work by email. Collaboration with local companies has made this real (Ranchordás 2020, 264). Similarly, in the Netherlands, the Enschede municipality contracted a private provider to develop an app (Enschede Fietst) to nudge citizens into cycling in

[1]The implementation was part of the RUGGIDIZED smart city project.

town and reward them for such behaviour[2]. Smart nudging practices can nevertheless pose risks for citizens' autonomy (Galič 2019, 255–61). For instance, in Eindhoven (Netherlands) some smart lightning systems technologies have been installed to "de-escalate" aggressive behaviours of pedestrians in one of the most popular nightlife areas of the city. This system was at the core of De-escalate, one of the initiatives of the umbrella project Stratumseind 2.0, which aimed to create a "living lab" (Stratumseind Living Lab, SLL) of smart technology experimentation. Psychology scholarship has shown that spotting colour lights can influence personal emotions and mitigate people's reaction when they lose control (Galič and Gellert 2021, 5). For example, faint and warmer colours come with lower excitation; by the same token, people tend to slow down their breath when they are exposed to low-frequency flickering orange light. Direct bright light, moreover, can enhance self-awareness. Using lighting tools in real-time can thus prove crucial to influence citizens' behaviour in the streets. Nudging by means of smart lighting systems, albeit "easily resistible" (Galič 2019, 6), steers people's conducts for a benign purpose.

The smart city regulation between privatisation and data commercialisation

Cities have implemented smart city projects through various legal tools. Local regulatory efforts are illustrative instances of "regulatory capitalism" in miniature: the privatisation of urban services is not pure deregulation, but a way for "different kinds of actors (to become) important national, regional and global regulators" (Braithwaite 2008, 29). In this sense, cities have accessed the political arena as autonomous global actors in an effort to inspire and shape international agendas, either by means of soft law tools[3] or in transnational networks[4] (Swiney 2020, 229; Voorwinden and Ranchordás 2022).

[2]By the same token, the news that Google Maps entices users into "eco-friendly routes" (by reaching a destination using the least amount of fuel possible) recently hit the headlines.

[3]An illustration of soft law in action is the Declaration of Cities Coalition for Digital Rights, aiming "to protect and uphold human rights on the internet at the local and global level". Another example is the International Open Data Charter, as is investigated in the subsequent section.

[4]An illustration of the coalescing trend is the G20 Global Smart Cities Alliance, which "establishes and advances global policy norms to help accelerate best practices, mitigate potential risks, and foster greater openness and public trust". Another example is Eu-

Municipal institutions routinely come to terms with private actors to implement smart city technologies. Just to give a taste of the business growth, the smart city market is meant to reach $3 trillion by 2025, exceeding the size of all traditional business sectors (Morozov and Bria 2018, 6). The public and private actors' interactions in the smart city implementation mostly rest on public-private partnerships (Halpern et al. 2013). A striking illustration of the trend is the IBM "Smarter Cities" project, which puts together government technologies for city management. Amongst other things, IBM smart package encompasses water and energy management solutions, data-driven transportation systems, and financial designs[5] (Albanese 2020, 185). All in all, private conglomerations' role in the smart city signals a shift from public infrastructures built for the common good to corporate arrangements of urban service provision, firmly anchored in public-private partnerships (Cardullo 2021, 44; Sadowski and Pasquale 2015). Quite unexpectedly, "such a shift in the ownership of what were public assets (privatisation) and provisioning of services (marketisation) has been driven by arguments concerning efficiency, competitiveness, and value-for-money that paved the way to strong austerity policies" (Cardullo and Kitchin 2019, 816). As Ranchordas maintains (2018, 155), citizens are therefore increasingly considered as consumers or end users of data-driven services, or even the objects of data collection practices, rather than politically engaged actors[6].

Viewed through the lens of the "conventional" private initiatives and the PPPs, novel challenges related to the ways in which returns and gains from data production are allocated ensue. More specifically, data produced in the smart city do not always contribute to "collectively participated" democratic forms of urban management (Zoonen 2020 ; Viljoen 2021). Citizens are usually unaware of the fact that a private corporate partner collects data (Ranchordás 2020, 265). Private actors contributing to developing smart city services, moreover, frequently commercialise citizens' personal data.

rocities, a network which brings together more than 190 cities in 38 EU countries and representing 130 million people over Europe.

[5]IBM products for smart urban governance have played a major role in the construction of Chinese cities as well (Drahos 2021, 158–61).

[6]See also Zuboff (2019), claiming that individuals turn into the raw material of data extractive practices, and Cohen (2019, 48 ff.), conceptualising the "biopolitical public domain".

Some examples are illustrative in this respect. For example, smart waste management providers, such as the WasteHero App, commercialise the personal data of users [7]. By the same token, the Italian smart grid provider EnelX has designed an app, YoUrban, that allows citizens to report failures (e.g. breakdowns) of the smart street lighting system. According to the privacy policy, EnelX is entitled to use (and transfer to other businesses upon payment) the personal data of the app users for marketing purposes, market research, and profiling. Similar considerations apply in respect to tools hoarding urban mobility data (UMD) as well. UMD plays a prominent role in the smart city since it connects together micro-mobility and small-sized electric vehicles, such as electric scooters, mopeds, skateboards, bicycles, or even cars (Frosio 2020, 166). In the smart city, mobility has gradually turned into Mobility-as-a-Service (MaaS), which is anchored in putting together various forms of transport services in just one single mobility solution accessible on demand. The business model works as follows: a MaaS operator enables a broad range of options, be they public transport, ride, car or bike-sharing, taxi or car rental/lease, or a combination thereof. MaaS assembles and "platformises" various services. Users benefit from the MaaS inventory as they can use an app to access mobility by means of an individual payment channel instead of a myriad of ticketing and payment operations. As signalled by the public-private partnership MaaS Alliance, "for its users, MaaS should be the best value proposition, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys as well as the entire system of mobility services". An illustration of MaaS solution is the Nugo app, which gathers diverse Italian transport services[8]. As other smart city applications, MaaS's success rests on data harvesting by a great deal. In particular, MaaS operators collect data from different sources, these being governments, public authorities, communities and individuals themselves (Cottrill 2020, 51; Frosio 2020, 174). All in all, MaaS providers monetise their practices by processing data for purposes even very dissimilar to simple urban service provision. The most used processing purposes include service optimisation,

[7]According to its privacy policy, the waste management app WasteHero Installation app shares data with third parties , including Google Play Services, which commercialise data for providing targeted advertisements.

[8]https://www.nugo.com/nugoweb/about (website inaccessible since mid-2022).

marketing communications, automated profiling, as the privacy policies of the apps Nugo[9] and Moovit demonstrate.

As signalled above, to be efficient and gainful, smart city applications work on the back of large-scale data extraction, collection and (re-)use. Thus, adopting a viable data governance system plays a critical role in how a data holder can allocate benefits and risks of the most strategic asset of the smart city, i.e. data. In the subsequent section I scrutinise the implications of two macro-categories of data governance mechanisms on which the literature has spilled much ink now. One is based on substantial access barriers resulting in "data ownership", the other is grounded in widespread data availability and sharing practices amongst diverse actors ("commons-based data governance").

The making of Urban Data Commons: mapping the debate on data ownership and access-enhancing practices

As is shown in the foregoing, the smart city is more than sensors, bits, cables, and trappings. Its functioning depends on how a processing actor uses citizens' (big) data by a great deal. Dependence on data-driven technologies calls for transitioning to "data-driven urbanism", an urban governance mode resting on a vast deluge of "real-time, fine-grained, contextual and actionable data" about cities and their citizens (Kitchin 2016, 2; 2018, 44–54; Goodman 2020, 824). Just to name some data types and categories, one may think of data on use of electricity, methane and water; information on public and private transport (location and movements); maps; municipal bodies and public administration (services, performance and surveys); surveillance data (CCTV and location) (Kitchin 2016, 2). All these instances reveal datafication of some kind of human activity or behaviour (Sadowski 2019). Human behavioural data is used to elaborate statistics and predictions of urban needs and individuals' conducts. Technological devices allow smart city vendors to transform citizens' actions and interactions into data. In doing so, intensive data processing activities feed predictions of citizen behaviours and forms of "anticipatory governance" (Cardullo 2021, 31; Zuboff 2019).

[9] https://www.nugo.com/nugoweb/static/content/nugo/info_registrazione.html (website inaccessible since mid-2022).

That said, how municipal institutions and/or private providers govern such data impacts the potential for drawing valuable insights from them to create public value. In the smart city, data governance takes the form of "data ownership" or "commons-based data governance".

Data ownership

The legal literature has investigated how "data ownership" takes place in empirics and pragmatics by means of legal, behavioural, and technological barriers. In another article, I have already sketched out the main features of the proprietorial phenomenology in practice (Fia 2021, 185–87). Legal barriers have to do with IP rights (copyright law, database rights, trade secrets) and data protection provisions restricting data access. Behavioural barriers are grounded in contractual limitations (e.g. terms and conditions) routinely encapsulating exclusionary practices of private actors holding unequal bargaining power. Technological barriers pertain to implementing technical protection measures (TPMs) and using non-interoperable formats preventing effective data exchanges (Hoffmann and Gonzalez Otero 2020). All in all, private vendors creating and installing sensors and data processing systems in smart cities are under no obligation or not willing to freely share data they collect with others (Kitchin 2018, 51). Such a behaviour stems from the privatisation of public services in urban environments. Data about public transport, energy and water is usually black-boxed and access thereto is restricted (Kitchin 2018, 51). Public authorities frequently restrict access to urban data as well by siloing it within departments. Thus, data is not shared "with other units within the organisation, or open for other institutions or the public to use" (Kitchin 2018, 51). Identifying who controls data resulting from the aggregation and combination of manifold data sources can nevertheless be challenging (Löfgren and Webster 2020, 10).

Commons-based data governance

Urban scientists, activists and legal scholars have advocated for a data governance system anchored in open data access approaches in the smart city (Morozov and Bria 2018). The reasons for putting forth access-widening solutions lie in the relational features of data (Viljoen 2021). Urban data stems from the activities of multiple actors involved in a web of voluntary and involuntary cooperative relations. This is the case of many aspects of human life

(Benkler 2011). More specifically, urban data amounts to depictions of interactions and cooperation webs without which data analytics and other reuses would not be that valuable. There are many instructive examples in this respect. For instance, urban public transit equipped with sensors produces real-time information on traffic which would not come into existence without passengers using an app. By the same token, data on urban congestions illustrates the activities of citizens and people passing through cities that drive around the streets. Waste management aggregated information is just about how much rubbish citizens produce. Illustrations of urban data at work are countless, but they all tend to show how citizens' cooperation is a necessary condition for smart city technologies to work. Hence, the conclusion that recognising data ownership amounts to tolerating dominance of smart city contractors over datafication of citizens and local communities. Furthermore, acknowledging control over data access means accepting private appropriation of information in the public domain. Accordingly, advocates for data access in the smart city have shaped novel forms of commons-based data governance. They aim to form the UDC, meaning that they emanate from urban life itself, "in mundane and very material practices of urban-dwelling, social encounters and social reproduction" (Cardullo 2019, 90; Lange 2019). Even more fundamentally, commons-based approaches of data governance propose ways of fostering data use and access opportunities as opposed to the shortcomings of data ownership.

Commons-based data governance in the smart city revolves around four strands of research and approaches. First, one may examine whether and to what extent the statements of principle in some local by-laws on "urban commons" (e.g. in Italy) can also apply to UDC where they refer to digital goods. Second, other projects of commons-based data governance have specifically aimed to regulate data flows in the smart city. Some municipalities have implemented thoroughgoing public-led regulatory projects, such as the Decode Project in Amsterdam and Barcelona. In other cities, private conglomerations have taken up the reins of regulation by winning bids and implementing large programmes of data governance. This is the case of Sidewalk Toronto in Canada. Lastly, there have been cases of bottom-up informal approaches, whereby groups of citizens and (small) local communities have taken the lead on grassroots initiatives opening up data access.

UDC in municipal regulatory arrangements on urban commons

The general principles of UDC governance lie to some extent in existing local legal instruments that do not specifically target datasets. In this sense, some municipal regulatory arrangements (*Regolamenti*) can be viewed as regulatory attempts in the way in which they allot digital assets (such as the UDC) to local communities. The *Regolamenti* are anchored in Article 118(4) of the Italian Constitution, stipulating that the State and local governments at different levels shall foster citizens' autonomous initiatives aiming to promote the general interest of the collectivity (the principle of "horizontal subsidiarity") (Marella 2019, 886; Albanese and Michelazzo 2020, 25). The Italian debates about the commons as goods that are functional to the fulfilment of the fundamental rights and liberties (Marella 2017) have been the main source of inspiration in this respect (Quarta and Ferrando 2015). By means of the *Regolamenti*, the municipal authorities turn into enablers of some communities' practices, rather than providers of urban services (Albanese and Michelazzo 2020, 20). More specifically, "citizens can take care of urban spaces such as flowerbeds, urban gardens, or empty buildings, entering into a sharing agreement (*patto di condivisione*) with the municipality" (Mattei and Quarta 2015, 305). Some *Regolamenti* mention "digital assets" amongst the goods and services that communities can govern by means of sharing agreements with the municipality. For example, according to the *Regolamento* of Turin, "urban commons" are "those material, immaterial and digital goods that the citizens and the administration recognise as being functional to the exercise of fundamental rights of the individual, the individual and collective welfare, the interest of future generations" (Albanese and Michelazzo 2020, 32; Albanese 2020, 178).

Likewise, even Italian regions have included the protection of the commons amongst the purposes of the public activities listed in the regional statutes (*Statuti*). In this sense, the *Statuto* of the Tuscany Region reads:

> the Region pursues, amongst the prominent purposes, […] (m-bis) the protection and valorisation of common goods, meaning material, immaterial and digital goods fulfilling benefits that are functional for exercising the fundamental rights of the individuals, the individual and collective welfare, social cooperation and the life of future generations, and the promotion of widespread forms

> of participation to the shared governance and to the enjoyment of such goods[10] (Consiglio regionale della Toscana 2005).

The municipal arrangements, albeit significant, are vague for thus far they have not been coupled with an effective governance system applying to the digital and immaterial assets, including UDC and general-purpose technologies for urban management. Other criticisms of this regulatory tool concern the excessive paternalism which they bring about. In some cases, they are statements of principle that might turn into forms of urban governance handing over public functions to private actors in order to attain interests of local governments (Marella 2019, 887). This looks like the case of most technological applications of the smart city.

Public-led projects of data governance

In some cities, UDC regulation has come about in such a way as to allow multiple actors to access data and, by doing so, increase data availability for a wide number of citizens, communities, and small local companies. More specifically, initiatives opening up data infrastructures have already played a prominent role in urban locales, since they take on board rights and interests of actors that are side-lined from institutional urban policy-making. A common way for municipalities to achieve these objectives in pragmatics is to incorporate clauses in single service provision agreements forcing smart city contractors to share data they hoard with municipal authorities for free. Some transnational legal tools also move in the same direction[11]. An illustrative example is the aforementioned International Open Data Charter, which establishes six principles for national, regional, local and city authorities on "how to publish data" and make it "open by default". Section 17(a) reads:

> the adherents to the International Open Data Charter will develop and adopt policies and practices to ensure that all government data is made open by default, as outlined in this Charter, while recognising that there are legitimate reasons why some data cannot be released (Open Data Charter 2015).

[10] Translated by the author.

[11] See Section 1 above.

Moreover, it mandates data publishing on a central portal, data release in open formats, free of charge and without mandatory registration (Section 24).

Other municipalities have objected to private data accumulation by setting up even more radical and far-reaching projects (Morozov and Bria 2018, 3). Commons-based governance of UDC has been successfully put into practice in some urban contexts by creating diffuse data access rules and decentralised information systems (Beckwith, Sherry, and Prendergast 2019, 205). As Morozov and Bria state, "a new cluster of start-ups, SMEs, NGOs, cooperatives, and local communities can take advantage of that data to build apps and services most relevant to them and the wider community" (Morozov and Bria 2018, 32). Municipal institutions have started programmes espousing this approach to govern data in multiple cities. One may think of the DECODE project in Barcelona and Amsterdam, MyData in Helsinki, and DataCités in Paris (Morozov and Bria 2018, 31). These projects revolve around open data infrastructures, open source initiatives, and open standards limiting control over data harvested by smart city contractors. Even more fundamentally, they aim to

> create a decentralised innovation ecosystem attracting critical masses of innovators, able to shift the current centralised data-driven on-demand economy towards a decentralised, sustainable, and commons-based economy. "Data commons" initiatives put agency and data control into the hands of citizens, with the aim of leveraging collective data and information to improve citizens' wellbeing (Morozov and Bria 2018, 32).

Even more fundamentally, the making of open "data commons" reinjects enthusiasm into putting the politics of the smart city in the spotlight. Governing data produced in the smart city, thus, is a complex and dynamic process that involves different actors and (necessarily) clashing trade-offs, such as the control over data and technological infrastructures (Calzada and Almirall 2019, 3).

Private-led data governance in the smart city

Municipal governments have not been the main drivers of change towards data openness and sharing activities everywhere at the same degree. In

some urban realities, private actors (businesses and/or non-profit organisations) have taken the lead of shaping data governance in the smart city. An illustrative example in this respect is Sidewalk Toronto, an urban development project that was initiated by the non-profit organisation Waterfront Toronto and abruptly cancelled on 7 May 2020, arguably due to economic uncertainties (Scassa 2020). On 17 March 2017, Waterfront Toronto (WT) issued a request for proposals aiming to develop Quayside, a twelve-acre area in Toronto. The call for bids ended up being won by Sidewalk Labs, an organisation owned by Alphabet Inc. (Google's parent company). The project partners intended to plan an innovative data-driven urban environment, which would come to be known as "the world's first neighbourhood built from the internet up" (Badger 2017). Later on that year, WT and Sidewalk Labs concluded a Framework Agreement that was never disclosed, prompting criticisms from public officials and public contempt (Goodman and Powles 2019, 464). As the project evolved later on, public criticisms even spread to the project itself, for the latter lacked transparency and issues such as citizens' privacy, surveillance and data sovereignty were left behind (Scassa 2020, 47–48).

In spite of the controversies, Sidewalk Labs (2018, 12) committed to develop a "civic data trust", that is to say a model for stewardship and data management "that approves and controls the collection and use of data for the benefit of society and individuals". Moreover, it charged an independent third party to supervise data sharing and make sure that "value from data goes to the people, communities, government, industry, and society from which it was collected, and that data privacy and security are protected" (Sidewalk Labs 2018, 12). The name of the data trust eventually changed into "Urban Data Trust" (UDT). The variation was due to the fact that many advisors were sceptical about qualifying the independent body as a trust in the private law sense, as there were neither beneficiaries nor trustees. Instead, the UDT was meant to be a "non-profit entity", whose legal nature and structure were going to be determined in light of the feedback of public bodies, communities, researchers, and industries (Sidewalk Labs 2019, 423). Initially, the entity would have a board comprising five members arguably representing the various stakeholders' interests: a data governance (or data privacy, or IP) expert, a community representative, a public-body representative, a private-sector representative, and an academic. The project managers, moreover, specified that the UDT could evolve into a public body in the long term.

Even more fundamentally, Sidewalk Labs (2018, 14) defined "urban data" as information collected in a physical urban space, including public spaces (such as streets, squares, parks, and other open spaces); private spaces accessible to the public (e.g. building lobbies, courtyards, ground-floor markets, and retail stores); and private spaces not controlled by those who occupy them (e.g. apartment tenants). The limitation of scope has to do with the geographical specificity of urban data. This could be considered as tied to urban activities in some sort of inextricable knot. Quite interestingly, the definition refrained from the usual (legal) dichotomy of "public" versus "private" sector data. As a consequence, "the identity of the party collecting the data was irrelevant to its characterisation as 'urban data' " (Scassa 2020, 52). Thus conceptualised, the urban data category showed clear operational shortcomings in the way in which it fails to delimit the scope of application of the data trust.

The making of the entire governance proposal then came to a swift and abrupt end in mid-2020. Overall, the governance model that Sidewalk meant to put in place was far too ambitious and sweeping: in short, it "tried to do too much" (Scassa 2020, 56). Although the proposed scheme had relied on extensive public consultations, the top-down approach that the project managers pursued failed to meet the diverse stakeholders' expectations (Scassa 2020, 56), engendering distrust and wariness towards the real intention of Sidewalk Labs. The excessively unilateral nature of the proposed UDT reinforced this belief by a good deal.

The beat of the informal drum

Informality has characterised most bottom-up practices undertaken by small local communities and citizens' organisations. A thorough study enumerates illustrations of communities "putting data in common" ("commoning")[12] and fostering use value in urban instances (Lange 2019). One may think of Verbeterdebuurt (a platform allowing citizens to report problems and connect them to local city councils), Geluidsnet (a citizen-driven initiative to measure noise pollution around Schiphol airport), DATAstudio Eindhoven (an initiative led by the Eindhoven municipality and Institute for Architecture, design, and e-culture Het Nieuwe Instituut aimed to open up non-datafied

[12]The Nobel laureate Elinor Ostrom theorised the "commoning" in self-governed common-pool resources (Ostrom 1990).

and fairly invisible issues that nonetheless have large societal impact, like loneliness, and make them publicly debatable) (Lange 2019, 77–79). Data production in some private applications (e.g. Waze, an urban traffic app) rests on informal processes as well (Cardullo 2019, 90–91).

Informality can prove to be a successful strategy in some cases to start out commons-based governance systems, as those of illegally occupied properties and street art works (Marella 2019, 885–86). Informal practices are nevertheless precarious and can rapidly go up in smoke due to the gradual loss of interest of some citizens taking part in the informal exchanges.

Value redistribution as a matter of data governance in the smart city

In the previous section we were presented with governance systems enhancing data reuse that aim to open up data access. Their core objective is to decentralise control over UDC by enabling citizens, communities and private agents to "take back their data" (Frosio 2020, 189) and therefore governing it "in common" and/or for the common good. Yet, some authors have challenged the approach and pointed to some inadequacies of the common-based data governance. The bulk of the weaknesses is related to the limited impact of workable alternatives capable of distributing value flowing from UDC. To quote Cardullo:

> Can "smart commons" guarantee citizens' right to the city through inclusive digital and social policies while promoting citizens' meaningful participation to urban life? "Smart commons" initiatives seem often to focus more on taking resources back from the circuit of capital circulation, rather than on the process that maintains and reproduces such a commons (2019, 86).

By the same token, greater data availability, albeit critical, does not necessarily mean fairer communities, nor more liveable cities (Cardullo 2019, 94), nor capital (re-)transformation into commons (Capra and Mattei 2015, 131 ff.). To be sure, enhanced data access would increase accountability, transparency, and competitiveness of smart city (private) actors. Many would be interested in accessing, exchanging, and sharing data. Commons-based practices, if they solely aim to open up data access per se, nevertheless leave out citizens whose data is routinely collected. On a closer inspection, small-

sized private companies, and public institutions mostly long for access to data held by smart city private vendors, whereas citizens as individuals and local communities in urban locales might not be eager to access or share data at all to gain some benefit. Reasoning by analogy, this is true if we think of the sectoral practices of agricultural data processing. In the farming sector, farmers may not be able to do much with free access to data. Open data approaches to farming data are, therefore, not necessarily "fair", as "these data may be informative to the actions of some, while others will not know how to interpret them" (Burg, Bogaardt, and Wolfert 2019, 5). Hence, the conclusion that viewing data governance in the smart city merely as a matter of data sharing is a tunnel vision, which can leave citizens making up urban communities aside–especially those who live in "non-datafied" and underdeveloped urban areas.

Opening up data access does not question the fact that citizens' data is up for grabs, and so it can be freely taken for making profits (Bodó 2019), pace distributional issues and impactful data re-uses for the local communities (Verhulst et al. 2020, 9). Powerful private actors thus extract value from widely available and (more or less) shared data resources, while urban communities producing them fantasise about building a commons (Frosio 2020, 172). All in all, commons-based data governance neglects to address value flowing from data, while focusing only on data (re-)uses (Bodó 2019). The related questions (i.e. data monetisation, data value extraction, value redistribution and so forth) remain therefore largely unaddressed[13] (Malgieri and Custers 2018).

Expanding on the above observations, I set out to get a better grasp of value generated by data processing practices in the smart city. Reflections on value can complement the focus on use that is the common thread amongst the aforementioned approaches of commons-based data governance in the smart

[13]Bodó makes the point with great clarity: "The current technical innovations seem to aim at creating infrastructures of collaboration and distribution, resilience in the production and access of commons. These do not, in any way, address the issue of how the peer produced value is captured, and returned to support the production of the commons. What I see is that projects small and large, marginal and central, still rely on donations, small bitcoins from individual users, or million-dollar grants from Google, in other words they depend on the generosity, ex-post gratefulness, reciprocity of all those who benefit directly, instantaneously from the commons. Can we expect a fair exchange of value? Can such a setup lead to a fair deal? Is this model really sustainable?" (Bodó 2019).

city. To break the deadlock, we should look into the conceptual frameworks that can better picture the complexity of urban socio-economic architecture impacted by smart city applications. Some valuable insights into the matter come, I argue, from the concept of externalities. According to basic economic theory, an externality is a cost or a benefit impacting a third party which is not willing to bear that cost or benefit (Besanko and Braeutigam 2014, 706). Depending on whether it produces a negative or a positive effect, an externality can be negative or positive. The former arises when an agent undertakes an action having an effect on other agent(s). However, the agent does not bear all costs of their decision by imposing some of them on the other agent(s) (Torre 2014). Negative externalities routinely circumscribe within legal systems what owners may or may not do with their property (Cooter and Ulen 2012, 105–7). Meanwhile, positive externalities are quite the opposite: they arise when an agent does not seize on all the benefits of their decision. Thus, the advantages impinge on other actors' welfare, absent an agreement amongst the parties (Torre 2014). Petit and De Cooman have recently viewed the externality as a conceptual framework to regulate artificial intelligence (Petit and De Cooman 2022). They investigate a regulatory model centring on the reflection that "law and regulation of AI purport to address externalities" (Petit and De Cooman 2022, 208). Thus, the externality concept may also fruitfully apply to data governance.

Private law (especially property and tort law) addresses negative externalities in multiple ways. One may think of trespass, nuisance, and servitudes in common law jurisdictions, or of extracontractual liability and property remedies in civil law countries (Siegelman and Parchomovsky 2012, 214). Demsetz (1967) argued that private property aims to internalise externalities by crystallising all the rights in the hands of an individual owner. Meanwhile, positive externalities usually find scant attention amongst private law scholars. Only in recent times some jurists have viewed some private law branches, that is intellectual property law, as legal arrangements designed to enhance positive externalities (Frischmann and Lemley 2007 ; 2009, 2019). By contrast, property laws and unjust enrichment laws have neglected positive spill-overs as a distributional matter since individuals, portrayed as absolute owners in Western legal systems, are entitled to internalise positive externalities. Hence, private law tool tend to side-line re-allocation of benefits and profits across the agent and the enriched third party (Vercellone 2020, 1–7). Distributive justice, therefore, is confined to public law (mostly tax law) (Quarta 2016).

The smart city is rife with positive externalities. I allude to the surplus of urban citizens' life which smart city contractors can harness as soon as urban smart tools and systems sprawl up in urban locales. One may think of how urban activities can positively impact on smart city vendors' activity, absent a specific agreement with citizens: traffic congestions, busy parking lots, electricity outages, brownouts, full rubbish bins, dry flowerbeds, and so forth[14]. As I have already mentioned in the previous section, the relational features of data make the data in the smart city a special sort that encapsulates the positive influence that citizens' practices have on it[15].

That said, we can come up with sources of inspiration for data governance models to tackle distributional concerns and test out their feasibility in respect to the smart city. One private law tool that may come to mind is unjust enrichment. In the following subsection, I will succinctly point out that this is not the case. We should then resort to other means. Two models are subsequently analysed. One theoretical prototype is the (large) ownership paradigm that E. F. Schumacher advanced in the 1970s. Schumacher's construct delineates quite a radical view of resource redistribution across wealth production schemes by valuing their urban component. Another viable force for governing positive externalities lies in the distributional tools which have been already tried out to some extent in some branches of private law, that is the IP sharing-benefit concept.

The little relevance of unjust enrichment

Unjust enrichment was acknowledged as a distinct branch of law, together with contract and tort, in the 16th and 17th centuries by late scholastic philosophers. The subject area of unjust enrichment, early theorists maintained, is any breach of corrective (or commutative) justice[16] whereby someone "unjustly enriched has used resources that belong to another person to

[14]The parties in the service agreements in the smart city are the municipalities and the smart city vendor. However, when it comes to SMU and, more generally, app-based services, smart city providers frequently conclude an agreement with single citizens. One may question the usefulness and relevance of the "positive externality" concept. That said, in these cases positive externalities flow from how smart city contractors monetise data by processing it for profitable purposes, such as commercialising data, building citizens' profiles, sending marketing communications, and so forth.

[15]See Section 2.

[16]In the Nicomachean Ethics, Aristotle singles out two justice forms, that is commutative (or corrective) justice and distributive justice. The latter aims to ensure, as far as possible,

obtain a benefit to which that person was entitled" (Gordley, Jiang, and Taylor von Mehren 2021, 526). Late scholastics argued that any case in which the defendant is enriched at the plaintiff's detriment suffices to ground relief.

The Aristotelians have inspired today's laws of unjust enrichment. Modern unjust enrichment, however, "deals with a favourable deviation from the status quo" (Zimmermann 1995, 404) due to a predetermined legal basis in civilian countries[17] or "unjust factor" in common law jurisdictions[18]. Given the prevalence of contract, tort, and property in most legal traditions, it is frequently seen as a residual category with little application range. Moreover, matters of distributional justice are left out from the objectives that unjust enrichment laws pursue (Vercellone 2020, 2).

Thus conceptualised, unjust enrichment can hardly help to redress positive externalities in the smart city. First, matters of value redistribution in the smart city are related to distributive justice, and not much to commutative justice. There is no question smart city contractors' profits are wealth shares anchored in an utterly legitimate service provision activity. It is difficult to rearrange unjust enrichment relief in such a way as to grant a share of smart city contractors' accumulation to the urban collectivity (represented

each citizen has a socially just allocation of resources; commutative (or corrective) justice safeguards the resource share of each citizen.

[17]Civilian jurisdictions have mostly espoused such an approach. To provide an illustration, Section 812(1) of the German Civil Code (BGB) reads: "one who has received something through another's performance or at his expense in some other way without legal basis (ohne rechtlichen Grund) is obligated to give it back" (Federal Ministry of Justice 2021). Amongst the legal bases are cases in which plaintiff was fulfilling a legal obligation; or was making a gift; or was fulfilling a promise to make a gift that is not enforceable because it was made without the required legal formalities (Gordley, Jiang, and Taylor von Mehren 2021, 535–36). The French Civil Code (Sections 1300 through 1303-1) and the Italian Civil Code (Section 2041) have adopted similar solutions.

[18]Common law traditions diverge from civil law systems in the way in which they construe unjust enrichment. English law, for example, links the relief for unjust enrichment to an "unjust factor", which can be plaintiff-oriented grounds of restitution (e.g. absence of intention: the plaintiff does not intend to benefit the defendant; vitiated intention: the plaintiff's intention result out of mistake, illegitimate pressure, undue influence, or personal handicaps, qualified intention), defendant-oriented grounds of restitution (e.g. exploitation: the defendant is subjected to undue influence or unconscionable conduct; free acceptance: the defendant received a benefit, being conscious that the plaintiff intended to be paid for it), or even policy-orientated grounds of restitution "ultra vires" (in general, see, for example, the English case Lipkin Gorman v. Karpnale. Ltd., [1991] 2 A.C. 548 (H.L.)(Gordley, Jiang, and Taylor von Mehren 2021, 530; Virgo 2015).

by the municipality entities). Second, expanding unjust enrichment rules by means of extensive interpretation and analogy does not seem viable since its prerequisites (i.e. the legal basis or the unjust factor) are stringent. Drawing recommendations in this sense that municipal actors can follow in public procurement and negotiations with private contractors, therefore, poses implementation problems.

Schumacher's critique of ownership of large-sized companies: taking redistribution seriously for big data ownership

A theoretical model into which it is worth looking is Fritz Schumacher's critique of capitalist ownership and the consistent normative proposal in *Small is beautiful: Economics as if people mattered* (1973, 262 ff.), a collection of essays which the author had found it hard to publish (Leonard 2018, 260). In the last two chapters of the book, the Austrian economist advances a radical rethinking of property relations. His basic assumption is the distinction "between (a) property that is an aid to creative work and (b) property that is an alternative to it" (E. F. Schumacher 1973, 263). The former rests on "something natural and healthy", that is "the private property of the working proprietor". The latter, meanwhile, is "unnatural and unhealthy" as the corporate owner "lives parasitically on the work of others". The dividing line between entrepreneurial models comes from the scale of a private company. Hence, different features apply depending on how large an enterprise is. In Schumacher's words:

> it is immediately apparent that in this matter of private ownership the question of scale is critical. When we switch from small-scale to medium-scale, the connection between ownership and work already becomes attenuated; private enterprise tends to become impersonal and also a significant social factor in the locality; it may even assume more than local significance. The very idea of private property becomes increasingly misleading (1973, 264).

In large-sized companies, private ownership turns into a "fiction for the purpose of enabling functionless owners to live parasitically on the labour of others" (E. F. Schumacher 1973, 267). The bulk of capitalists' success, Schumacher drives home, does not come only from their own virtues and merits, but arises with public authorities' actions towards building up an infras-

tructure that fosters companies' competition. Hence, the conclusion that it would be desirable that "the contribution of public expenditure to the profits of private enterprise is recognised in the structure of ownership of the means of production" (E. F. Schumacher 1973, 274). Schumacher scrutinises two poignant examples in which the property relations in question differ, to some degree at least, from the extractive ownership model. The first illustration is the Scott Bader Commonwealth. Dora Scott and Ernst Bader founded the Scott Bader Ltd., a company producing synthetic resins and composite materials, in 1921 in London. After converting to Quakerism, they brought "revolutionary changes" in the firm in the way in which they combined "freedom, happiness and human dignity (…) without loss of profitability" (E. F. Schumacher 1973, 275). In 1951, they established the Scott Bader Commonwealth, made up by the companies' employees, and transferred Scott Bader Ltd.'s ownership to them. Relying on decentralised power, the novel corporate governance mechanism has been successful for many years now (D. Schumacher 2011, 103–12).

Most importantly for present purposes, the second instance that Schumacher sketches out is what he calls "new methods of socialisation" (E. F. Schumacher 1973, 283). In this respect, drawing from the fact that private enterprise flourishes on the back of public expenditure on infrastructure-creating activities, public authorities should participate in the private profits. Specifically, they should be entitled to receive one-half of the distributed profits of large-sized private corporation by means of a fifty per cent ownership of the equity of such enterprises (E. F. Schumacher 1973, 285). Thus, such an ownership scheme would not amount to expropriation *sensu stricto*, since it would be "a direct public participation in the economic assets from the use of which taxable profits are obtained". Accordingly, this would embed the general public contribution and "non-capitalist social forces" (E. F. Schumacher 1973, 286) into creating private wealth.

Schumacher goes on to address some possible critiques of the proposed theory. First, he elucidates the rights associated with ownership of the "public hand". The public participation in one-half of the profits would encompass two groups of rights: managerial rights and pecuniary rights. The former has to do with corporate management. In this respect, the author has a penchant for linking public hand's participation to a right to information and observation of the business activities. Conversely, the public owners would not preserve voting rights in shareholder meetings. The main objective is to

ensure public accountability and transparency of corporations. As for pecuniary rights, the distributed profits would automatically go to the "public hand" holding the shares which ought to be, in principle, non-waivable (E. F. Schumacher 1973, 288). The equity share would replace other profit taxes (E. F. Schumacher 1973, 291). Second, Schumacher analyses what "public hand" is in empirics. In his view, it corresponds to the "local body in the district where the enterprise in question is located" (E. F. Schumacher 1973, 286). The local entity, however, is not necessarily a political elected authority, but a "Social Council" made up of local trade unions members, local employers' organisations, local professional associations and local residents. The Social Council would have transparency and accountability obligations as well (E. F. Schumacher 1973, 289). All in all, the aforementioned proposal would be a "constitution-making" exercise that private actors can introduce in an experimental and evolutionary manner (E. F. Schumacher 1973, 292).

Mainstream neoclassical economists have never considered Schumacher's bold proposal. This accounts for the nearly utter lack of critiques and studies of his ambitious redesign of corporate ownership. Admittedly, Schumacher's radical view may not find justification through the lens of efficiency claims and welfare maximisation. Yet, it can offer some motivating rudiments of novel ways of approaching data governance in the smart city. It is striking to see how Schumacher's proposal fits large contractors' operations in the smart city. His account tells a story of appropriation of publicly created infrastructure. As the case of Sidewalk Lab demonstrates, smart city contractors seize on the urban interactions' surplus to conduct their businesses. Their business model would simply not work without appropriation and commercial deployment of urban needs, activities, and relations. Data ownership's most distinctive feature is immateriality, meaning that datafication processes occur "discreetly", as a result of installing and utilising data-driven technologies in the smart city (Bibri 2019 ; Sadowski 2019). Most citizens do not even realise that data production and harvesting take place in the public space. Datafication of "non-capitalist" urban forces, such as citizens' cooperation webs and daily activities, nonetheless contribute to making smart city contractors' fortune by a great deal.

Several aspects of Schumacher's "new methods of socialisation" may help to form data governance policies for smart city applications. First, Schumacher focuses on how the public infrastructural urban components play a prominent role in building capitalists' success. This is exactly the case for

the urban locales and situations where citizens' data collection takes place. Second, he proposes a redistribution scheme (50% of shares to the "public hand") aiming to address the positive externalities arising in large-sized companies. He views the public constituent participating to the private gains as a local body in the district where an enterprise is placed. More than the formal nitty-gritty of his proposal, it is noteworthy how Schumacher sets out to link the production to a locally circumscribed environment. By the same token, multiple smart city applications heavily draw on technologies installed in local public spaces. One may think of smart traffic lights, CCTV cameras, and smart parking sensors. Even "moving" smart technologies, such as SMU, relate to productive "non-capitalist" forces occurring in discrete urban environments (e.g. people in a bus, a tram, traffic congestion at a roundabout and so forth).

Thus viewed, data production in the smart city would empower municipal authorities in negotiations to impose, say, a flat fee on smart city vendors based on various criteria, some instances of these being the urban place where a smart city technology is installed, the number of citizens involved, the neighbourhood size, and so forth. As for Schumacher's "managerial rights", the representative municipal authorities could be entitled to have a say when defining the rationale and the purposes of the data processing practices in the smart city. For instance, a veto rule of the local authorities over data commercialisation would improve citizens' control over personal data[19].

IP benefit sharing and (indigenous) communities: a new role in the smart city

The general thrust of Schumacher's argument on which we can heavily draw to develop an alternative is the stress on establishing redistributive obligations. As briefly signalled above, distributive justice as a goal of private law has never taken much root in the legal literature. The reason is that taxes-and-transfer payments are viewed as the most efficient and proper tool to attain redistribution considerations (Lewinsohn-Zamir 2006). There is, however, a growing trend in IP scholarship (Yanisky-Ravid 2017), reflecting property scholars' investigations (Alexander 2018), arguing in favour of pursuing reallocation by means of rules of private law. By the same token, the

[19]Similarly, veto rules would improve indigenous communities' bargaining power over their knowledge assets (Drahos 2014, 94–107).

scholarly focus shifts from intellectual property rights to IP owners' obligations towards the general public (Drahos 2016, 260 ff.; Li 2021, 9 ff.). Solely honing in on rights means justifying "the deceiving concept of absolute ownership and entitlement" and neglecting other values (Li 2021, 20). Thus, obligations of right-holders should aim to complement and counterbalance IP owners' privileges inhibiting others' rights and liberties.

The grounds for the distributive obligations can be the benefit-sharing schemes in international treaties. First, the benefit-sharing principle creates viable obligatory patterns in the way in which it imposes duties of profit redistribution on IP owners. In the 1960s, developing countries viewed the benefit-sharing concept as a strategic sovereignty-safeguarding means to secure the benefits of colonial peoples' exploitation of natural resources (Cabrera Medaglia and Perron-Welch 2019, 63). Later on, it was incorporated in international treaties, such as the 1992 Convention on Biological Diversity (CBD) and the 2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Resulting from their Utilization (the Nagoya Protocol) (Cabrera Medaglia and Perron-Welch 2019, 64) as a bulwark against intellectual property monopolies and, more fundamentally, extractive approaches to indigenous knowledge (Drahos 2014, 72 ff.). As a remuneration scheme, benefit-sharing revolves around the concept of sustainable development applied to traditional knowledge, genetic resources, and biological biodiversity. The recipients of the benefit-sharing programmes can be either States or non-state actors, such as indigenous communities. As for intrastate relationship, the benefit-sharing principle mandates States "to find an equitable balance between the interests of the countries of origin and those of States that have the technical and technological means to use GR develop and use technologies stemming there from" (Cabrera Medaglia and Perron-Welch 2019, 65). On a similar note, the Nagoya Protocol provides that shared benefits can be monetary or non-monetary in the Article 5(4) (United Nations - Convention on Biological Diversity 2011). Amongst monetary benefits, the Annex to the Nagoya Protocol mentions, amongst other items, access fees per sample collected, up-front payments, milestone payments, payment of royalties, licence fees in case of commercialisation, special fees to be paid to trust funds supporting conservation and sustainable use of biodiversity. Apart from international law tools, several constitutional texts enshrine the benefit-sharing principle

as well, an example being the Ecuador Constitution. The article 57(7) of the latter reads as follows:

> indigenous communes, communities, peoples and nations are recognised and guaranteed (…) the following collective rights: (…) participate in the profits earned from the plans and programs for prospecting, producing and marketing non-renewable resources located on their lands and which could have an environmental or cultural impact on them (República del Ecuador 2008).

Thus, a duty to benefit sharing mandates in principle remuneration of local communities as a result of commercialising local biomaterials and knowledge (Li 2021, 28). Notwithstanding its potential, the benefit-sharing principle frequently does not turn into effective rules in domestic legal systems. More specifically, principles such as the benefit-sharing "are important to design of property standards for indigenous knowledge", but they do not deliver binding systems for the protection of indigenous knowledge (e.g. proprietary-like regimes) (Drahos 2014, 77). In fact, some states (e.g. the United States) tend not to engage in reforms of the IP systems, feeling strongly that benefit-sharing is best effected through freedom of contract (Drahos 2014, 148).

Like Schumacher's ownership, benefit-sharing schemes can nevertheless bring some inspiration in the negotiations between municipal authorities and the smart city vendors. Analogies in the value formation are evident: a community creates a knowledge apparatus that a private conglomeration turns into exchange value. In one case, we are presented with an indigenous community, in the other, there is an urban community that is represented and mediated by local municipal authorities. Thus conceptualised, the benefit-sharing concept can then ground model clauses in the negotiations between municipalities and smart city vendors. For example, it may mean incorporating value redistribution in the form of differential fees to the advantage of local municipal authorities for commercialising citizens' personal data, as similarly established in the Annex to the Nagoya Protocol. Recent developments in the governance of non-personal data in India are a promising starting point in this respect. In 2020, a committee of experts appointed by the Indian government released a Report on Non-Personal Data Governance Framework (Indian Ministry of Electronics and Information Technology 2020), hereinafter the "NPD Report", that deals with the relationship between communities and non-personal data. Amongst the proposed model

rules, the report mentions the right of the community "to derive economic and other value and maximising data's benefits for the community" (Indian Ministry of Electronics and Information Technology 2020, 16). The datasets beneficial to the community form "high-value datasets" (HVD) and deserve special governance mechanisms. The management of non-personal datasets can be assigned to some data trustees that would "manage the non-personal data of a specific community and would have the ability to recommend soft obligations for "data custodians" processing such data" (Indian Ministry of Electronics and Information Technology 2020, 16). This aspect evokes the managerial rights as proposed by Schumacher. The community rights in non-personal data conjure up the ownership issues and community rights over natural resources (Nagaraj, Rao, and Shukla 2021, 20 ff.). Singling out a community when it comes to data production, however, can prove difficult due to its nebulous boundaries (Nagaraj, Rao, and Shukla 2021, 22). In urban applications, this reflection a fortiori holds true: it is challenging to circumscribe a discreet part of an urban community and its relevant distributional prerogatives. Moreover, the NPD Report stipulates that the data trustees must convey the "best interest" of the community to the data custodians by means of pieces of advice and guidelines. To partially redress these imbalances, the NPD Report allows (local) government authorities to act as the appropriate "data trustee" (2020, 18).

Conclusion

Tony Honoré viewed the right to use and the right to the income from a good as two essential, yet separate components ("standard incidents") of the governance model of resources par excellence, that is ownership. The paper has taken his note to heart by conceptualising data governance in the smart city as matters of data access, sharing, and (re-)use (Section 2) and matters of redistribution of the value/surplus flowing from data processing (Section 3). A thorough overview of the definitory matters and empirical trends of the smart city have introduced the scrutiny of the matters of data governance. Specifically, the smart city model is usually anchored in privatisation of data-driven services enabling smart city vendors to process citizens' data for purposes that differ from the mere provision of the service, making commercialisation and appropriation of data real. Against this background, legal scholars have examined whether fostering access can decentralise control over data. In this respect, public-led, private-led, and informal projects have en-

sued in some cities with mixed success (Section 2). I have then moved on to investigate the question of value flowing from the positive externalities in the smart city by looking into the governance tools that can value data value redistribution (Section 3).

Commons-based approaches of data governance go in the right direction since they foster data access opportunities, thus enhancing sharing and competition in the smart city. Yet, intensive data processing practices also create value. Being value allocation a critical distributive justice dilemma, I have singled out its sources, i.e. the positive externalities stemming from citizens' activities, interactions, and cooperation. I have then explored the arrangements that may help to incorporate distributional concerns into data governance in the smart city. Despite its potential, unjust enrichment as a legal tool does not offer viable solutions to address distributive matters related to data value. Schumacher's critical review of ownership in large-sized companies and the IP benefit-sharing principle, meanwhile, can spur some recommendations that can contribute to coupling data-use governance modes with data-value ones. One first proposal can be imposing fees on smart city vendors depending on objective criteria displaying the urban life component substantively taking part in one data-driven technology to maximise the data-related benefits for the citizens' communities. Another viable solution is giving the local authorities more leeway when it comes to defining the purposes of data processing practices of the smart city vendors (e.g. a veto rule over data commercialisation).

Further research is needed to turn the governance models into practical solutions to achieve effective redistribution schemes taking the value issue into account in the smart city. Each city, town or village is a world in itself, so the data governance responses should be context-dependent and in tune with the need of the specific urban locale. Moreover, value-(re)distributing fees may well raise quantification issues. Quantifying the data processing differential fees can follow the factors making the price for citizens' data higher, such as the size, the completeness, the accuracy, the uniqueness, and the degree of personal identifiability of datasets collected by smart city vendors. Obviously enough, these tools should complement the current commons-based data governance programmes in the smart city, rather than replace them.

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