

Big Data Inequality

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ABSTRACT: The age of digitalization has led to a rising big data insights trend. Our constant use of digital tools to master our world and our all communication via modern technologies has increased data transfer to be stored and analyzed. As never before, we are now able to derive inferences from big data. The most profitable corporations in the world are currently big data analyzing entities. In an effort to redistribute some of the gains of big data inferences to those who create the information and share their information output on a constant basis, several solutions have been proposed. Granting property rights to information retrieved online is one of the most promising solutions to cope with the fact that corporate capital is gained from our all information sharing online on a constant basis. When considering the establishment of private property rights of one's own data, the advantage lies in the controllability of information sharing and the monetization of information shared online. At the same time, inequality may be imbued in the idea to 'sell' private property data to big data analyzing entities. First, private property rights in data created online could lead to a divide between those who create more interesting and meaningful information by actively using the internet rather than passively consuming it. And people may differ in the degree of useful connections and meaningful conversations with them. Divides between US internet users versus European ones, which already now are skewed towards the US being more active internet users in comparison to Europeans being more passive ones, will rise. The education and income gap may also exacerbate if those with more skilled mindsets or those who can afford more sophisticated technology will be able to produce qualitatively and quantitatively richer data sources. Second, enabling to sell big data would incentivize a productive, active and meaningful use of the internet, which would set positive incentives to develop human capital in general. At the same time, however, there is the problem of abuse in markets. The reason why certain goods are not traded in markets is the fear over abuse and exploitation of minors or specially gifted. Like the restrictions of being able to sell one's organs in markets as for the fear that people may then start harvesting and exploiting dependents with limited mental capacity; similar restrictions may apply to the sales of internet data. Parents or custodians should not be incentivized to capitalize on their dependents' data. Third, data brokerage may become a lucrative business if one can sell data online. However, data brokerage platforms may favor certain digitalization hubs in the world which have the legal capacity and technological sophistication to implement high-tech market capitalization from data efficiently and effectively. This logistic peculiarity may hold risks of unjust enrichment of some advanced nations over other less digitalized areas of the world, which may drive the existing economic power divide in the international arena even further in the future. Potential remedies of alternative remedies are to tax big data gains and redistribute some of the gains to those equally whose data serves as building block for big data insights.

KEYWORDS: big data, data storage, digitalization, Digital Markets Act (DMA), Digital Millennium Copyright Act (DMCA), General Data Protection Regulation (GDPR), inequality, internet, knowledge, law & economics, privacy, private property rights, redistribution, sustainability, taxation, wealth transfer

Introduction

The age of digitalization has leveraged our potential to derive inferences from constantly-created big data masses. Unprecedented data storage and sophisticated computational power coupled with artificial intelligence machine learning capabilities have opened the gates for the evolving big data insights revolution.

Today, big data gains reaping companies have amassed a wealth of information that is oftentimes analyzed without fair share of insights gained. Big data analytics pioneering corporations have become the most powerful companies in the world when it comes to corporate revenue and market capitalization. Countries that have digitalization leadership are

already widening the inequality gap with countries that are not focused on building technological infrastructure and big data analytical capacities.

One of the strategies proposed by global governance experts to alleviate the big data gain divide within society is to grant property rights to one's own data in order to help redistribute our all labor force online being exploited by big data analytics corporations for their own gain. So far information derived online from innocent technology, internet or digitalization product users is not considered as a property right. It is rather seen as a right to be secured from privacy infringements. To bestow property rights for one's own data now appears as remedy to allow for protection of one's own data. Property in data is also seen as the key to enable sales of one's data online in the attempt to redistribute some of the big data age's gain to those who are producing information and sharing it online for the big data amalgamation.

In a Law & Economics approach, one could argue against this approach as for destroying some of the network effects of big data reaping online platforms. Opt-in solutions to share data will likely help in regard to privacy concerns online but set an incentive to hold back data sharing. Data sales options appear favorable for redistribution of some of the gains of big data insights to those who are producing the data. But at the same time, selling data will have several caveats:

First, an inequality gap may widen between those who create interesting data and those who are not 'wealthy' on insightful data when it comes to quality differences between communication and networks. Educational and professional divides within society could be exacerbated when starting to sell data as there may be more value in data from sophisticated communication and being able to sell data on more advanced data brokerage platforms. Educational and professional circles may vary in access to quality data and information sharing opportunities.

Second, selling data opportunities will likely shift protection of privacy demands to protection of vulnerable populations of abuse of the data sales options. Custodian rights and obligations will have to be advanced and data fiduciary concepts extended on a personal level. Corporations, platforms and custodians would be incentivized to sell data on behalf of their employees, users and protected vulnerable populations and would therefore require being monitored.

Third, data brokerage could not only heighten prevailing inequality gaps between rich and poor as well as productive and less productive nations. Data brokerage will also lead to new market behavior, such as powerful corporations having the advantage of exponentially rising value of information. The more information a corporation holds, the more information it can retrieve from another bit of information. Market mechanisms would need to be adjusted for this, potentially leading to the creation of bidding platforms where those with higher big data insights reaping capacities should face a higher price for information purchase options. The technological and technical details of creating such a market appear questionable in light of secondary data brokerage market opportunities. The divide between technology-savvy nations and those countries without sophisticated digital means will likely be exacerbated if such market dynamics will start playing out.

This article is structured as follows: First, the big data age and the privacy paradox of internet users will be captured. Second, the opportunities to secure privacy online will be discussed with attention to regulatory attempts and market forces aimed at securing one's online data with property rights. Third, potential implications of private property rights to one's own data will be discussed. The final discussion provides an outlook on future research avenues.

The big data age

Technology innovations have prospered in the big data age. Digitalization has advanced the ability to constantly communicate and interact with one another online. Data is created by our individual online behavior in transactions and interactions. The use of online technology has led

to most sophisticated opportunities to derive inferences from the amalgamated mass of information constantly created online around the world. Big data has become the source of knowledge generation of our times. Some continents, countries and technology providers have gained an enormous competitive advantage to retrieve insights from our all technology use online. The most powerful big data reaping entities account – by now – for the world’s most profitable companies in the world. The rapid integration of 5G, The Internet of Things, Artificial Intelligence and Chat-GPT in our lives lets this trend appear to be a continuously rising one.

Main characteristics of the digital world are that it is a data-driven economy, which is highly concentrated with only around 5-7 big gatekeepers who control most of the big data reaping capacity in the world. Big data reaping platforms oftentimes benefit from direct and indirect network effects as well as economies of scale and scope (Bentata 2024). Most of the big data companies are housed in the US, China and Europe. The internet itself lacks regulation as the borderless character of internet usage and data transfer makes any legal or regulatory attempts almost impossible. Oftentimes the revenues streams of third-party financed businesses in big data entities are opaque and the insights derived from big data not shared with the general public, who produces them.

The upsides of the big data world are that trends can be derived from our all communication and interaction help being prepared for crises as big data insights aid in anticipating future conditions. The communication monitoring and tracking may also help making the world a safer place. Cost optimization and lower environmental impact of communication were additional initial arguments for digitalization. Overall, there are estimated welfare improvements associated with big data generation that added up to 1.9% growth to the EU economy in 2020 as well as 5% productivity and 6% profit gains (Bentata 2024; Buchholtz et al. 2014; McAfee and Brynjolfsson 2012; OECD 2015).

From a consumer perspective, targeted contents help make wiser and faster choices that lead to better customer satisfaction and generate revenue for corporations. Big data inferences also allow for structuring logistic value chains more efficiently with technological advancement accounting for cost-saving opportunities. The so-called feedback loop addresses that the more users spend time on platforms and share information and create big data, the better this creates users’ big data, resulting in better personalized services (Bentata 2024). Personalization reduces costs and allows better measurability (Bentata 2024). Targeted advertising also offers real-time results and advanced customer management (Bentata 2024). Better personalization boosts the overall user experience, which heightens the attractiveness of platforms for users. The more valuable the platform thereby becomes, the more users it attracts, leading to a positive reinforcement loop that fuels the big data economy (Bentata 2024).

In terms of monetization capacities, more information leads to better targeting of consumers, which increases advertisement revenue for online interaction platforms. The more users a platform offers, the better it can attract advertisers, who are willing to pay more in bidding for advertisement space the more users and the longer users spend on a platform. Higher advertisement revenues will increase the profitability of platforms, which allows to innovate and improve services for a growing user pool due to constantly-increasing user satisfaction and a growing user body. Advertising innovations include direct advertising, ad networks and real-time bidding with intermediaries between supply and demand for advertising space (Bentata 2024).

The privacy paradox

Not to mention crime, crowd instigation and manipulation risks implied by digital mass media, when big data is collected through publicly available content online, critical questions of privacy infringements arise. The big data age has created opportunities to track, collect and analyze a rising amount of data exposed online. Publicly observed (e.g., in open profiles, accounts and IP addresses), voluntarily provided information (with and without knowledge shared) but also

constant tracking (via cookies, browser and device fingerprints, web bugs, beacons, history, cross-device tracking, apps...) are only a few ways our digitalization use is reaped for information by big data processing entities (Bentata 2024).

Problems arise from data not being a common good and the unawareness of what inferences are derived and what long-term implications the big data retrieved can have for the individual, society and the environment (Puaschunder 2022). The question of the use of data and a knowledge generation taxonomy are rising (Puaschunder forthcoming). The value of information is exponentially rising, creating an inequality in the opportunity to derive value from an additional bit of information. The market for information consists of only a few large-scale gatekeepers that reap most of the advantages of big data inferences. Data as such is therefore not valuable, only in connection with a wealth of other data only held by a few monopolist institutions.

The big data amalgamation trend is oftentimes referred to as a privacy paradox exacerbating problem that infringes on democracy and a free society. The privacy paradox is addressing the fact that most internet users are not aware of information tracking. Even if people realize the constant data tracking, most of them do not care. There is a general ignorance of platforms' unfair enrichment and intransparent use in the generation of knowledge from information provided by online users. Even if people start caring about big data generated from their digitalization platform use, there seems to be a behavioral fallacy, which makes people disclose information to a degree they would rationally not consent to. People seem to not protect their privacy depending on the context and wording (Acquisti and Gross 2006; John, Acquisti and Loewenstein 2011). Similarity conditions appear to heighten information sharing (Moon 2000). Disclosure of information appears to be pleasant, even backed by physical evidence of heightened dopamine release when exhibiting personal information (Tamir and Mitchell 2012).

Protecting big data privacy reaping

As for privacy concerns with the reaping of big data, several strategies are currently discussed and implemented:

Overall general regulatory action includes the Digital Millennium Copyright Act (DMCA) in the United States as well as the General Data Protection Regulation (GDPR) and the Digital Markets Act (DMA) in Europe.

The Digital Millennium Copyright Act (DMCA) came into effect in 1998 in the United States and has since then been used to protect copyrights but also privacy concerns online. This copyright law implements treaties of the World Intellectual Property Organization in the age of digitalization. Penalties are defined for the production and dissemination of technology, devices or services that unlawfully control access to copyrighted work. The DMCA plays a critical role of copyright infringements on the internet with an exemption from direct and indirect liability of Internet service providers and other intermediaries. Multiple amendments to the DMCA have been made until today. In the implementation of the DMCA copyright holders' rights are protected from online theft – that is, from the unlawful reproduction or distribution of their works. The DMCA thereby covers anything that is copyrighted. Since the DMCA allows for taking down copyrighted work from public display, it has been used to protect privacy with its effective notification and high penalty system installed for copyright infringement.

The General Data Protection Regulation (GDPR) was targeted at securing privacy rights to online open (accessible to everyone), personal (right pertaining to individuals) and contractual data (Bentata 2024). Data is not a property or commodity but perceived to be a right to withhold use of. The GDPR is now protecting “fundamental rights and freedoms of natural persons, in particular, the protection of personal data” (GDPR 2016). Subject of protection is personal data, defined as “any information relating to an identified or identifiable natural person” (GDPR 2016). A natural person is “one who can be identified by reference to

an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of natural person” (GDPR 2016). Practically, this includes all information identifying natural persons, e.g., like names, contact details, gender, IP addresses, sign up information,... Thereby the GDPR targets particularly sensitive information, such as racial, ethnic, political opinion, religious beliefs, trade union memberships, genetic or biometric data, health and sexual orientation (Bentata 2024). This includes pseudonymised or key-coded data, which can be processed in a way that identifies a specific person (Bentata 2024).

The GDPR grants rights to interrupt collection and processing of data, right to data portability (to take data with you) and the right to be forgotten (ordered deletion of information collected). GDPR rights secure that there is no undisclosed transfer of property rights in the production of data but also enables information providers to control their own data (Bentata 2024). Overall, it is estimated that the GDPR has raised the cost of compliance that can erect barriers to entry (Bentata 2024). The GDPR redistributed power dynamics towards favoring large gatekeeper companies (Jia et al. 2018). People tend to trust large internet platform providers more information than small newcomers (Campbell et al. 2015). Due to the privacy paradox, individuals are still believed to disclose data if the tools they use online are useful or necessary for them. Overall, the success of GDPR is questionable as revenues from online sales for EU firms dropped by an estimated 10%, page views by 7.5% and the number of third-party tracking by 6.2% with the implementation of the GDPR (Goldberg et al. 2019). There is the assumption that reluctance to share data has led to a redistribution of power leading to a concentration enhancement of trusted large gatekeepers (Goldberg et al. 2019; Goldberg et al. 2024). The GDPR is assumed to have had a negative impact on innovation and start-ups (Bentata 2024; Campbell et al. 2015; Johnson et al. 2022). Higher compliance costs for small and medium enterprises and users’ preference to share data with large market leaders as they were already used to interact with them, but also relaxation due to trust in the EU regulating and monitoring internet conduct, are unforeseen impacts of GDPR (Bentata 2024).

The Digital Markets Act (DMA) now takes into account the market structure of some companies being gatekeepers. As an *ex ante* regulatory attempt, the DMA targets large digital platforms that function as gatekeepers to promote fairness and contestability in online markets (European Commission 2022). Gatekeepers are thereby understood as those entities that “have a significant impact on the internal market” with an annual turnover of 7.5 billion Euro or 75 billion market capitalization (European Commission 2022). Gatekeepers operate one or more important gateways to 45 million active users as customers or 10.000 active business users annually (European Commission 2022). Gatekeepers also enjoy or are expected to enjoy entrenched and durable position in their operation for at least 3 years (European Commission 2022). With the DMA, gatekeepers are obliged to refrain from “combining personal data sourced from different services; allow business users to offer the same products or services at different prices or conditions; allow business users to promote offers to and conclude contracts with end-users acquired via the core platform services regardless of whether they use the core platform services of the gatekeeper or not; refrain from requiring business users or end-users to subscribe to, register or interoperate with any of the services proposed by the gatekeeper as a condition to access, sign up or register to any of its core platform services; prevent side-loading, self-preferencing, limited access to data generated by users” (Bentata 2024; European Commission 2022). Bentata (2024) points out that *ex ante* regulations face difficulties in inevitable lags, regulatory uncertainty, threshold effects and can become a defense against liability.

Market solutions proposed

Newest developments in data protection advocate for securing property rights for data in order to not automatically pass on ownership in personal data to platform providers. This is meant to stop

use of data by platform providers by default without information on how data is used or any monetary value transfer from the big data reaping entity to the information producers and providers (Bentata 2024; Purtova 2018).

Innovative market solutions to protect privacy and allow the monetization of data for the producer of information is the contract-based approach. Internet users are thereby given the option to decide for every use of platforms whether they want to use it for free while giving up the rights to their data usage or pay for the service with automatic non-tracking and privacy protection installed.

A decentralized information pooling project is ‘Solid,’ which is a world wide web decentralizing project initiated from the MIT. Solid stands for Social Linked Data. This property-based approach features decentralized online applications that enable individual users’ control. Individuals are granted private property rights in their own personal data as users are enabled to store their personal data in so-called “pods” (standing for personal online data stores) in a decentralized network solution. The users of Solid can sell differentiated access to their data pods to monitored data brokers.

Big data inequality

Granting property rights to one’s own data online is currently subject to debate as a private market sector solution enhanced by privacy protection rights. Property rights could help redistribute some of the gains from big data insights derived online to those who produce the ground data sources, the internet users. In an applied Law & Economics analysis, however, one could argue against this approach as for destroying some of the direct and indirect network effects of big data reaping online platforms. Opt-in solutions to share data will likely help with privacy concerns online but set an incentive to hold back data sharing.

Big data monetized by its producers may hold several unforeseen inequality exacerbating moments: First, an inequality gap may widen between those who create interesting data and those who are not ‘wealthy’ on insightful data. While this solution grants individuals rights and monetization opportunities to their own data, novel inequalities could arise from the value of data and data sharing capabilities being distributed unequally throughout society. Already now there is literature on the inequality gap rising in those who use the internet productively with producing unique and creative output that can be shared and others only passively consuming the internet without any substantial knowledge production from the online consumption. It is assumed that education and salary levels are positively correlated with valuable data production online. And there may be a societal divide between those who have better strategies and access to data brokerages online. Country differences in the gap between digitalized nations and non-technology enhanced nations around the world would exacerbate. Within society, existing wealth disparities would be heightened as wealth would enable to create data with third-party users on devices that are owned. The pay gaps would likely also be accentuated as those with means to produce data may also have better access to data brokerage platforms and internet auctions. Therefore, overall educational and professional divides within society are prospected to be exacerbated when starting to sell data via private property rights assigned to one’s data creation.

Second, selling data opportunities will likely shift protection of privacy demands to protection of vulnerable populations of abuse of the data sales options. Custodian rights and obligations will have to be advanced and data fiduciary concepts extended on a personal level. Historically, selling certain goods, such as blood and organs, is restricted in most parts of the world. The rationale behind the integrity of the body to not be a sellable good is that selling body parts would lead to incentives to ‘harvest’ not only one’s own body for profit but also to infringe on other’s bodily integrity for profit. For instance, it is expected that organ black markets would grow in such a legal climate. Parents would be incentivized to sell their children’s body or custodians would be tempted to sell body parts of vulnerable populations,

e.g., like specially gifted. Selling the body would also lead to a skewed sample of those who are more tempted or in need to sell their body, e.g., drug addicts or people with lower opportunities to earn a living from regular work. These peculiar groups would imply a negatively-skewed sample that will have a propensity to not offer as good blood or organs than the general population holds and especially altruistic people have. One can imagine addicted people being more under pressure to give their organs for money and therefore offering a worse good than the general population or a benevolent organ donor gives for their relative. Likewise, incentivizing for data production sales could degrade the produced data. Those under pressure to gain from their data, may likely be those with less income or facing less opportunity to earn a living through other market endeavors. Inferences derived from this inferior data may not be as rich and helpful for the general population. Gaining from data therefore has the potential of a negative externality of the overall good of data losing in quality. On the other hand, one could imagine that incentivizing for data sales could produce a larger amount of data and a positive incentive to educate people how to produce more valuable information. New data management coaches may evolve that connect with data brokerages and inform how to generate more valuable and profitable information.

Third, data brokerage could not only heighten prevailing inequality gaps between rich and poor as well as productive and less productive nations. Data brokerage will also lead to new market behavior, such as powerful corporations having the advantage of exponentially rising value of information. The more information a corporation holds, the more information it can retrieve from another bit of information. Market mechanisms would need to be adjusted for this, creating bidding platforms where those with higher big data insights reaping capacities should face a higher price for information purchase options. The technological and technical details of creating such a market appear questionable in light of secondary market opportunities. The divide between technology-savvy nations and those countries without digital means will likely be exacerbated if such market dynamics will start playing out. Data brokerage as a growing industry could be an innovative productivity gains sector. Conventional Gross Domestic Product (GDP) measurement may start having to integrate data gains in national productivity calculus as there is a lack of this feature in contemporary productivity measurement (Puaschunder 2022).

Discussion

The discussion over privacy infringements online has just recently begun. Regulatory attempts to curb privacy predicaments ex ante for consumers have had some success but can still be refined. There are unanticipated downsides to regulate online markets upfront or only in some territories of the world. The divide between gatekeeping entities online that can derive a multitude of information from single users given their wealth in previously collected information is increasing.

Future research avenues may delve deeper into industry-led fiduciary duty models that incentivize corporate social responsibility on privacy matters online. Information campaigns that already have helped to build a common understanding of the privacy infringements online must be enhanced and fortified. The problem of human discounting fallibilities and a now present should be addressed when it comes to sharing information online. While corporations are – by now – well informed about privacy infringements online due to regulatory control, individuals seem to still lack the capacity to oversee the future consequences of their innocent information sharing online today. For instance, school children posting information online but also parents laying open private pictures of their children may have future consequences if countries start using a social credit scoring or employers systemically start scraping information online before hiring individuals. All these factors should become subject to debate in information campaigns but also educational settings. With digitalization progressing at an enormous speed, also the social implications and environmental impacts of big data insights should become thematized. Big data as such holds the key for prosperity based on constant

innovation and better understanding of the common knowledge distributed in society. Big data yet also holds social, environmental and ethical edges, which should be debated as we all proceed in online exchange and gain insights from it.

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