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A Bottleneck for Open Banking

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A Bottleneck for Open Banking*

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Abstract

We discuss a critical bottleneck of any Open Banking initiative that forces market participants to share granular-level information from their clients. We argue in favor of realigning property rights of personal data with individuals, such that they can monitor, administer and understand pecuniary and non-pecuniary compensations from third-party usage. Finally, we present a novel decentralized technology capable of overcoming the bottleneck.

Keywords: Open Banking, Property Rights, Personal Data, Production Chain

JEL codes: xxx

*Irene Ng is also acting as CEO of Dataswift. This document is based in part on Ng (2018). The views expressed are those of the authors and should not be interpreted as reflecting the views of Bank of England.

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1 Background & Introduction

Open Banking (OB) initiatives around the world are either in discussion, or are at different levels of implementation, see Ehrentraud et al. (2020). At its core, OB requires separating the production of financial services from their distribution by relying on Application Programming Interfaces[1] (APIs). Although it's initial goal was to increase competition in the payment and banking industry, it has far reaching consequences on the creation of information sharing/enriching infrastructures. We discuss a mayor bottleneck and propose a technology-driven solution that realign property rights towards individuals.

In the UK, where this initiative is already implemented, the Competition and Market Authority (CMA) argued that the banking industry suffered from inefficiencies. On the supply side there was a large concentration on the four main commercial banks as they represented more than 70% of the market, and that could translate into higher prices. On the demand side, there was evidence of significant switching costs as banks' customers showed lower switching rates compared to other industries. The CMA concluded that banks' customers had limited capacity to exert competitive pressure on traditional banks. Engagement was one part of the problem. Banks' customers were not using optimally available financial services. On top, market frictions also play a role. Even for engaged customers, the CMA argued that there were significant search and switching costs.

Breaking large banks was not the solution as the banking industry already had several niche banks. Customer engagement was the main concern and the chosen path was to increase the number of intermediaries. Authorities did not try to implement a market-based solution because banks had to willingly share granular-level information about their customers' activities. Banks would fail to coordinate as individual financial institutions had strong incentives to free-ride and deviate from an information sharing equilibrium. The Open Banking initiative required a new information sharing/enriching infrastructure.

The CMA implemented measures to reduce entry barriers at the banking industry, and to increase customers' trust. Firstly, incumbent banks had to share data on customers' transactions, financial products offered to them and their respective pricing. Secondly, third-party providers had to be authorized by the regulator, data sharing could only occur under explicit consent, common

[1] According to Egner (2017) APIs have four main characteristics. First, they can be classified according to their level of openness. Second, they are essential for value creation as developers can create "on top´´ of the bank's application and help them distribute and innovate; also banks can use them as a marketing device; and finally they can be used to create syndicated loans with other banks. Third, APIs require several layers of standardization compliance, namely, legal, operational, functional and technical.

standards were created to guarantee a secure sharing process, and explicit measures were put in place in the event of security breaches.

Other jurisdictions. According to Ehrentraud et al. (2020) several jurisdictions have already implemented, or are close to implement, OB initiatives. Two remarks withstand. First, while in some jurisdictions banks must share customers' data, offered financial services and prices, with registered TPPs using APIs, in other jurisdictions regulators just provided recommendations and different initiatives to encourage banks to share their information. Second, even for those countries where is mandatory, the actual implementation could vary. Jurisdictions could have different approaches about how much time TPPs should keep customers' personal data, also they could have different requirements to sell/share acquired information to fourth-parties.

Compliance at multiple jurisdictions is costly and might be used by incumbent financial institutions as an entry barrier.

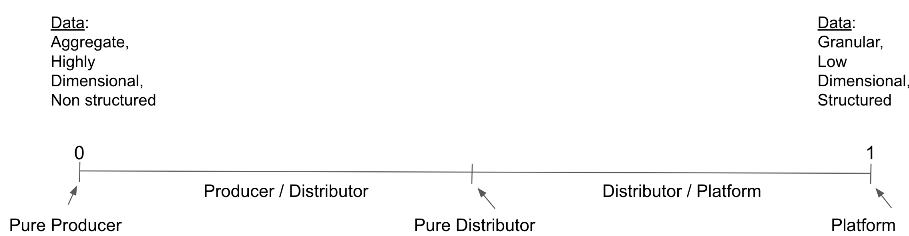
2 Data Sharing Infrastructure: A Production Chain Approach

According to Egner (2017), OB force traditional banks to migrate from a "product centric´´ scheme towards a "customer centric´´ scheme. In the former, banks used to create a menu of financial services and distribute them to their customers through their branches, website or mobile apps. In a "customer centric´´ scheme the production and distribution of financial services are not necessarily bundled and could be provided by different institutions. Industry participants should decide which financial services to produce, and which to offer, even if they are produced by another financial institution.

We argue that the banking industry, after OB, could be analyzed as a production chain where information is a key production input. For the sake of the argument, consider traditional banks that produce financial services and distribute them to borrowers. After OB they can distribute financial services from other banks, significantly reducing switching costs. Banks would specialize in producing some financial services, and would assign the remaining effort in reaching particular segments of the population. As we move downstream the chain firms will spend more efforts in the distribution than in production. At the extreme of the spectrum we have a match-maker, an institution that only connects borrowers and distributors of financial services and that is capable to manipulate/comply/enrich highly granular personal data.

In figure 1 we synthesize this idea. Assume that personal data is the only production input and financial institutions are distributed along the unit interval. The production chain of the banking industry starts with institutions that specialize in the production of financial services using aggregate levels of personal data. Then, as we move to the right, financial institutions start distributing their products coming from other institutions until we reach a point were institutions only distribute financial services at a single population niche. Distribution is costly because to reach multiple population niches higher granularity of personal data is needed. As we move downstream, institutions are capable to process, and comply with, highly granular personal data.

Figure 1. Production Chain induced by Open Banking



One insight from Figure 1 is that sharing/enriching private information is an increasingly costly endeavor. First, higher granularity generally comes along with more regulatory compliance. Second, all personal data doesn't arrive in the same shape and form, thus financial institutions must be flexible and innovate on its manipulation/enrichment/analysis capabilities. Third, if financial institutions want individuals to share confidential information, alongside with financial information, they need to assign property rights on individuals. Following Kikuchi et al. (2018) terminology, financial institutions face managerial costs convex in nature.

Another insight from Figure 1 is that financial institutions strategically pick their location on the production chain. Institutions upstream supply inputs to other institutions downstream. The trading of personal data between financial institutions is not frictionless, we must factor in transaction fees, taxes, bargaining power, information asymmetries, bribes, etc. Again, following Kikuchi et al. (2018), transaction cost will shape trading patterns between institutions along the production chain.

As suggested by Coase (1937), and formally studied by Kikuchi et al. (2018); Yu and Zhang (2019), the optimal size of the firm and the price function are uniquely determined in equilibrium.[2]

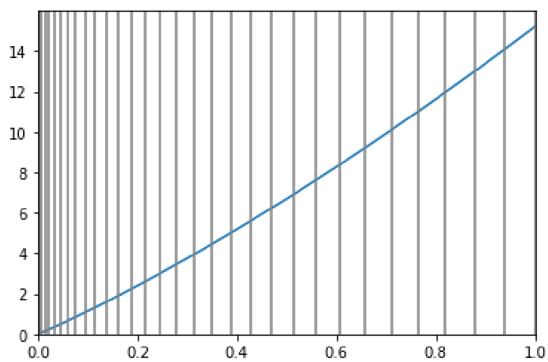
[2] See Theorem 3.1 of Kikuchi et al. (2018) and Theorem 3.2 of Yu and Zhang (2019) in a generalized model where

In equilibrium the marginal cost of managerial costs of a firm will equal the marginal cost of the firm upstream adjusted by a transaction cost.

There are three equilibrium properties that hold beyond the simple framework of Figure 1, see Yu and Zhang (2019). First, pricing is strictly increasing as we move downstream the production chain. Second, firm size increases also as we move downstream. Third, higher transaction costs will increase the equilibrium price function.

Figure 2. Low Transaction Cost: Number of Firms and Price

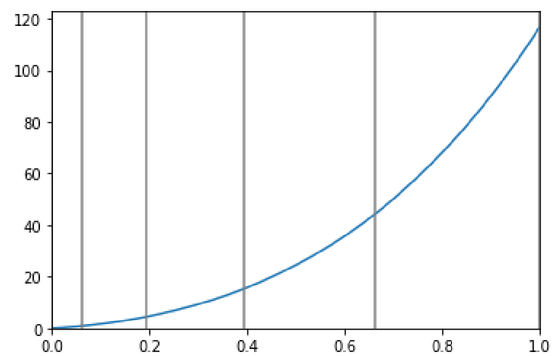
The horizontal axis is the unit interval and each division represents a different firm over the interval. The increasing line is the equilibrium price function.



Source: Adapted Python codes from Kikuchi et al. (2018)

Figure 3. High Transaction Cost: Number of Firms and Price

The horizontal axis is the unit interval and each division represents a different firm over the interval. The increasing line is the equilibrium price function.



Source: Adapted Python codes from Kikuchi et al. (2018)

Figures 2 and 3 show that, given a fixed level of managerial cost, higher transaction costs imply fewer institutions at the production chain and higher level of prices.

Some evidence on managerial costs. Under this framework managerial costs and transaction cost are fundamental. Recent data from two new participant at the global credit market, Fintech and BigTech (Cornelli et al. (2020)), shows the impact of low managerial cost.

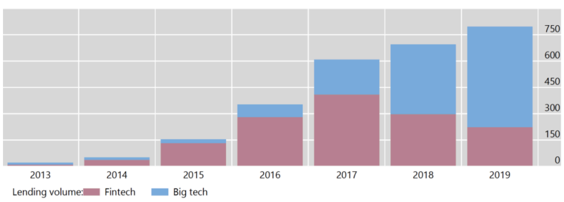
Figure 4 shows that BigTech growth lending has been outpacing Fintech's. Fintechs do not rely on (short-term) deposits, as traditional banks do, to provide (long-term) loans. They rely on different funding sources such as securitizations, own equity capitalization, or they directly match lenders and borrowers. Example of Fintechs are Zopa and Funding Circle in the UK, Lending Club and SoFi in the US, Yiren in China, among others. Figure 5 shows that the largest share of FinTech

downstream firms may engage with multiple upstream firms.

credit is in China and uses loan crowdfunding. The Americas also hold significant activity but their funding rely on balance sheet lending. In Europe the funding is through equity crowdfunding.

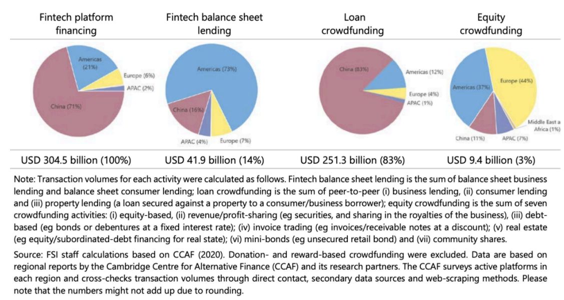
BigTechs are large digital service institutions that have a sizable network of non-financial institutions doing e-commerce, social media, search browsers, etc. They indirectly provide credit through a financial service subsidiary, or through a partnership with another financial institution. Examples range from Ant Group or Tencent's WeBank in China, to Amazon in the UK, US and other countries, to Google in India, to Mercado Libre in Latin America, to M-Pesa in Africa, or to Go-Jek in Southeast Asia.

Figure 4. FinTech and BigTech Lending



Source: Cornelli et al. (2020). Data for AU, CN, EU, GB, NZ and US

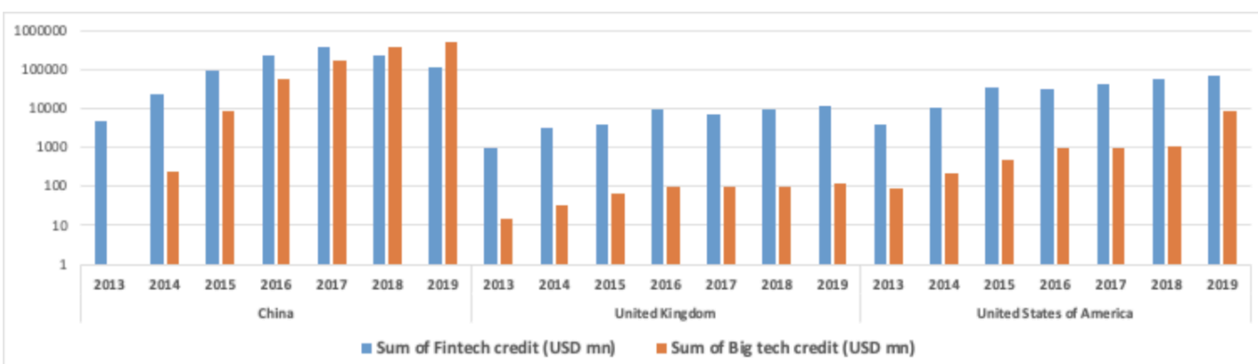
Figure 5. FinTech Financing by Region and Activity in 2018



Source: Ehrentraud and Quevedo Vega (2020)

Figure 6 presents FinTech and BigTech credit in China, UK and the US.

Figure 6. FinTech and BigTech Lending by Jurisdiction (USD mn in logarithms)



Source: Dataset of Cornelli et al. (2020)

The situation in the UK and the US is different from the situation in China. Despite the institutional differences we observe an important increase in BigTech credit relative to FinTech's.

We posit that BigTechs are gaining market share because they have lower managerial costs than

FinTech. They have access to multiple information sources at the customer level, they usually are technology driven, and competition authorities are still learning about how to regulate them. We expect that through innovation and standarization of personal data managerial costs will constantly decrease.

High transaction costs might also play a part in BigTech success, we don't want to downplay it's role. But, unlike managerial costs, reducing transaction costs will prove to be a harder task.

3 Property Rights as the Bottleneck for OB

Property rights for personal data directly affect transaction cost. Currently, it's true that individuals are legal owners of the data they generate, but it's impossible to know what pieces of information are used after anyone agrees to share it with a third party. Moreover, individuals must go through a very lengthy process to track down what pieces of information were anonymized and shared/sold with a fourth-party. And even, must go through a more excruciating process to guarantee their data is deleted from a third-party's server if solicited. For all intents and purposes, average individuals, without the time and expertise to track and analyze their data, just have the right to share it and hope to receive a good service back.

Financial data under OB is tightly regulated. Regulated Third-Party Providers (TPPs) have to satisfy strict compliance requirements, at least in the UK where OB has been implemented, but still if a security leakage occurs and personal data is lost, in practice multiple financial institutions could be involved in the transaction and it is difficult to assign responsibilities. To fully exploit the benefits of OB individuals must provide financial institutions more personal data. The infrastructure of personal data sharing/enriching should allow for multiple sources. Non-financial data should reflect other aspects of daily lives, for example social media data, commuting patterns, health records, among others. Also, benefits would increase further if it's possible to track similar information for their close relatives. The associated risks of providing TPPs with that much information are self-evident but not unusual as BigTechs should already have access of some of that information, or can infer it based on information from other individuals with similar observable characteristics.

Banks' customers would feel comfortable sharing additional information if appropriate regulation requirements are implemented. In other words, we would need to implement an analogous regulation but in every other industry from which TPPs can obtain information. This is not a minor task as we should ask ourselves if it's feasible in the first place. Probably, instead of going down that path, we should ask for alternatives where individuals feel safe sharing massive loads of personal information.

The theoretical background of our claim is the Coase Theorem.[3] The latter serve as a benchmark, see Medema (2020), from which we emphasize the impact of not having well defined property rights on personal data as after individuals share it they can hardly monitor/administer/delete it.

The immediate consequence of lack of property rights is that individuals will not share different types of personal data to a single institution without the implementation of potentially intricate compliance regulations. Transaction costs will definitively increase, and following the production chain approach, the equilibrium price function of personal data will also increase, followed most likely with a reduction of social welfare. Subsection 3.1 elaborates on this point further.

3.1 The welfare impact of the bottleneck

Could we argue that OB with adjusted property rights (OB2.0) is welfare enhancing?

First, we need a criteria for comparing government policies. Following Hendren and Sprung-Keyser (2020), we propose considering the Marginal Value of Public Fund (MVPF) metric because it just uses (i) the willingness to pay (WTP) of recipients, (ii) the net costs for the government, and (ii) the long-term benefits for recipients. Formally, $MVPF_i > MVPF_j \iff \frac{WTP_i}{NetCost_i} > \frac{WTP_j}{NetCost_j}$

Second, we need to define the policies to compare. On the one hand, we have the standard OB and its $MVPF_{OB1.0}$. On the other hand, we have OB2.0 and its $MVPF_{OB2.0}$.

WTP for OB1.0 and OB2.0 should have at least three components, namely, consumption of general goods (abstracting from financial services), consumption of financial services, and insights. The distinction between the first two components is that an efficient OB should help individuals smooth their consumption patterns, allowing to increase their long-term utility. Thus, the first component is the present value of future consumption, and the second is the present value of financial services. The last component, insights, is capturing the idea that individuals assign value on holding personal data, from them and even from their close relatives, because probably they can take better decisions in the future, or they assign a non-pecuniary value to it. Data is an asset for individuals and not only a medium of exchange.

[3] There are multiple ways to state it, but according to Rochet and Tirole (2006) "[it] states that if property rights are clearly established and tradeable, and if there are no transaction costs nor asymmetric information, the outcome of the negotiation between two (or several) parties will be Pareto efficient, even in the presence of externalities."

Government net costs can be divided it into three groups, namely, managerial costs, transaction costs, tax revenues. The first group encompasses administrative costs, and costs for storing/processing/enriching personal data. The second costs are fees between upstream and downstream financial institutions and that involve, directly or indirectly, sharing personal information from clients. Finally, the third group are tax revenues governments obtain from the financial services.

Finally, we make two simplifying assumptions. Previously, we discussed the reasons why BigTech credit is outpacing FinTech's. Thus, for WTP we assume the only difference between OB1.0 and OB2.0 is that Insights (the third component) is larger when property rights are clearly given to individuals as they are willing to provide more personal data. For Net Cost, we assume that transaction costs (the second component) is larger for OB1.0 as under the production chain approach higher transaction cost increase the equilibrium price function.

4 Property Rights with Legal and Technological Design

For the exchange of a digital good such as personal data to occur in a meaningful way, some exclusive rights must exist with the owner to exclude others from making arbitrary copies of the data.[4] This is the case also with personal data controlled by firms, which we term OPD (organisation-controlled personal data). OPD access rights are granted to other organisations through API access terms and conditions or through permitted selling of data to data brokers. We define PPD as person-controlled personal data, the personal data where intellectual property rights and excludability of the data (control) is with individuals.

Since digital personal data consists of bitstrings, and is created by the technology that collects it, it is possible that rights could be retained by individuals if they legally owned a technological artefact capable of real-time, on-demand and dynamic exchange of personal data. In addition, since personal data is non-rivalrous and infinitely expansible, copies of the data may be accorded with a different set of legal rights, rights that could be controlled by individuals themselves.

Finally, since signals are generated from combinations of personal data, the quality of the signals would depend on the ease of different personal datasets to be combined, bundled and exchanged so that the economic value of the data signals are high.

[4] At the Appendix we provide a brief analysis about related literature on personal data.

We present the design and built of the HAT (Hub-of-all-Things) technology and legal artefact.

Technology. In essence, the HAT is designed and constructed as private, standalone databases embedded within containerised microservices for personal data that have clear boundaries of data at rest, data in transit and data in use, see HAT (2020). Aside from just being a datastore, containerised microservices wrapped around the database means it can be a ”micro-server´´, capable of processing data within. By isolating each HAT micro-server from one another so that every HAT is one containerised microservices-enabled database per person, boundaries are clear and rights can be bestowed.

Technologically, the schema (data structure) was chosen to be flexible for outbound data, but keeping the rigidity of inbound data. Apps that give data into the HAT retain their original table and data structures within their namespaces e.g. Facebook namespace in the HAT has a Facebook table of data, same with their original names, similar to Spotify, Google Calendar, Fitbit etc. Outbound data from the HAT, however, can allow infinite combinations of data values across datasets. Each of these data values and bundles can be named and then exchanged through standard APIs using standard Internet protocols and encryption in real time. Within the HAT comes the technological capability of embedding functions e.g. pre-trained machine learning algorithms that transform data within the HAT and generate new data signals that sit within the HAT, which can be exchanged through the standard APIs if the individual wishes to.

Legal Rights. Personal data use contracts cannot specify all states of nature or all future actions and use of the data in advance. When there are states or actions that cannot be verified ex post by third parties, they are therefore not possible to be contractible ex ante. This means that the contract must include discretion and that discretion is to be exercised by whoever is allocated the ”ownership´´ rights to the personal data.

The literature on incomplete contracts (see Hart and Moore (1990); Aghion and Bolton (1992); Dewatripont and Tirole (1994)) has typically focused on the question of which party in a contract should have the right to undertake certain actions in the management of those assets. If contracts were complete, it would make no difference who was allocated that right. However, incompleteness of personal data contracts matter in terms of who has the power to take action, and the presumption is always that the economic actors will do so according to their interests. Deciding who should have the power to take certain actions is therefore a matter of foreseeing which actors will be most likely to act in the desired way.

In the case of personal data, it is clear that future usage of one's personal data must rest in the control of individuals, because this would reduce the incentive for the firm to sell on the data, especially when such an action may be obscured from the individual. Legal ownership of rights to the micro-server can be bestowed due to the presence of clear boundaries resulting from HAT containerisation, see HAT (2020).

Owners of such an artefact can therefore be afforded all of the intellectual property rights of the micro-server, reducing ambiguity of personal data use. Containerising one individual's data within his own database wrapped with microservices allows individuals themselves to be a 'data controller' and 'data processor'.

Finally, the HAT core technology is uploaded to GitHub[5] under an open-sourced AGPL license (not be closed even if built upon), ensuring that any code within the HAT, which reveals how data is being handled within the HAT, is transparent to all.[6] Given that data within the boundaries of the firm cannot be meaningfully "propertised" by individuals, a non-rivalrous copy of the same data within a HAT micro-server with the same intellectual property rights on the copy for individuals as the rights of the source for the firm, can be an equitable arrangement.

5 Final Remarks

Open Banking initiatives unbundle the production of financial services from their distribution, and have the objective of enabling end-users to exert competitive pressure on financial institutions. Its success depends on the efficacy of an infrastructure of personal data sharing/manipulation/enriching based on APIs and analytics capabilities. The main bottleneck of this infrastructure is the property rights of personal data, and we argue it requires individuals fully owning the rights for the data they produce as it's the only way for them to share sensible non-financial data.

[5] Visit `https://github.com/dataswift`.

[6] In terms of usage of data within with HAT, it is clearly necessary for the data to be unencumbered so that full excludability rights are retained by the individual through the HAT and not by the source of the data. In this manner, micro-server access to data from the current sources such as Google or Facebook could be considered as subject access, whether directly or through a third party, which, under European law, suggests that the ensuing data retrieved by individuals are owned by them. While this is legally not proven in case law, a case can be made that micro-server owners have rights to reuse and reshare their own data within it as co-producers of the same data.

Appendix

Related Literature. Research on personal data-sharing in the economics of privacy (e.g. Acquisti et al. (2016)) have found that disclosing personal data do bring benefits to individuals, such as immediate monetary compensation (e.g. discounts), intangible benefits (personalisation and customisation of information content) and price reduction as an effect of more targeted advertising and marketing, information-based price discrimination, and more targeted ads to better inform consumers (cf. Yang (2020); Garratt and Lee (2020); Akcura and Srinivasan (2005)). However, such sharing also brings about costs and negative externalities for example, privacy costs, and subjective and objective privacy harms. Conversely, it has also been suggested that sweeping privacy regulation that result in firms not being able to obtain personal data will lead to opportunity cost and inefficiencies (Acquisti (2010); August and Tunca (2006); Van Zandt (2004); Anderson and de Palma (2005); Hann et al. (2006)).

With the increasing economic value of personal data, scholars have been polarised into two main camps. The first, regulatory camp advocates for privacy protection as an end in itself, regardless of economic consequences. The underlying notion of such an advocacy is that privacy is a human right to personal data protection. This is consistent with the EU Charter that data being processed for specified purposes and with consent of the person concerned or with some other legitimate basis is laid down by law (Godel et al. (2012) p.42; Charter of Fundamental Rights of the European Union, OJ C 364, p. 10, 18.12.2000, Article 8). Enforcement of regulation would also pose a challenge since there is doubt as to how much regulatory powers governments actually have over the Internet. Any attempt of territorial governments to enforce privacy regulations could increase the likelihood of data-driven companies (whose profits depend significantly on data) to employ legal arbitrage, moving to jurisdictions outside the regulation. In the extreme, adverse selection could drive out firms benefiting from the data economic chain, reducing tax revenues for the country.

With the continuing advancement of digital technology, the argument for personal data protection has evolved from the human rights concern to an economic rationalisation based on the trade-offs between risks and return (De Corniere and Taylor (2020); Godel et al. (2012)). This is the approach taken by the self-regulatory camp, proposing that a market solution exists as a trade-off between privacy and the benefit from data usage (Acquisti et al. (2016); Acquisti (2010)). This camp proposes that individuals could be assigned property rights to the information so that they are able to contract with third parties on how they might use it. Legal scholars have advocated the 'propertization' of personal data and argued against the imposition of legal limits on data trade i.e. that there is no need for "inalienabilities" (i.e. any restriction[s] on the transferability, ownership or use of an entitlement (Rose-Ackerman (1985)). The self-regulatory framework advocates the exchange of data and data protection to increase aggregate welfare, emphasising market self-correction for efficiency outcomes and the regulators' role as one of steering the market through a combination of incentives, disclosure policies and even liability (Acquisti (2010)).

Unfortunately, the practical implementation of a self-regulatory framework faces huge challenges because many of the data exchange contracts are incomplete and there is very little transparency about the secondary uses for the data (Beresford et al. (2010); Godel et al. (2012)). Property rights are a challenge for individuals to exercise when the personal data is held by firms collecting the data and not by individuals themselves (Shapiro and Varian (1997); Laudon (1996)). Since personal data is often mixed with other data belonging to the firm, the lack of boundaries would make property rights for individuals too much of a challenge to implement and enforce, leading to higher transaction costs. In addition, third parties buying and selling personal data could impose social costs on individuals since individuals are not directly involved in these transactions, resulting in the externalities that are not internalised by the firm (Godel et al. (2012); Odlyzko (2003); Swire and Litan (1998); Acquisti (2010)).

Aside from the challenge in implementation, others have also argued against the trade or propertization of personal data due to its impact on privacy. With the development of technology and devices that can generate finely-grained information about consumers' privacy preferences (McGeveran (2001)), trade of personal data could lead to its commodification and contribute to additional privacy intrusions (Tuan (2000)). Additionally, there could also be a risk of market failure. Recognising property rights in personal data could not only encourage more trade in personal data and thus result in less privacy (Cohen (2012)), it could lead to underinvestment in technology and services that enable the expression of privacy preferences. This would then result in greater information asymmetries between firms and individuals whose data is collected (Langer (2003); Schwartz (2004)). Scholars have concluded that there is just no simple rule on whether privacy of personal data raises or reduces welfare as it depends on the circumstances (Hermalin and Katz (2006); Taylor (2004)). However, it is commonly acknowledged that a free market in personal data will not provide an economically-efficient outcome. The degree of negative externalities within and across markets will depend on circumstances, as will any increase or decrease in welfare (Hui and Png (2006)).

Personal data is widely used to create personalised offers such as products, prices, diets, recommendations, insurance, that are tailored to the characteristics of particular persons. There is much literature on whether personalisation improves exchanges and market efficiency, drawing from work on asymmetric information (Akerlof (1970); Stiglitz (1975) and product differentiation (Mussa and Rosen (1978); Katz (1984); Moorthy (1984). It is no surprise therefore that new ways to gather more personal information would proliferate and their resulting data would find a market. Current regulation now implicitly acknowledge that personal data is a commodity, tradable and subject to the laws of supply and demand (Godel et al. (2012)).

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