The Benefits and Potential Costs of a Digital Economy

by

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The Benefits and Potential Costs of a Digital Economy[§]

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Abstract: Computerisation, or more generally, digitisation, of an economy has brought about substantial benefits. It has greatly increased productivity. It has significantly advanced both the pace and the scope of economic globalisation and international division of labour. However, digitisation can also enable, through the collection and assembly of individual-consumer-specific information, price discrimination by a seller of a product, which results in the consumer surplus of the individual being appropriated. Moreover, the widespread use of email and other message application platforms operated by profit-making private enterprises also facilitate the collection and assembly of vast amounts of individual-consumer-specific private information without the explicit and specific consent of the individual consumer, information which can be used to his or her detriment. Possible remedial measures are proposed.

[1] Ralph and Claire Landau Professor of Economics, The Chinese University of Hong Kong, and Kwoh-Ting Li Professor in Economic Development, Emeritus, Stanford University. He wishes to thank Barbara Fraumeni, Linda Jorgenson, Ayesha Macpherson Lau, Kevin Stiroh, and Khuong Vu for helpful comments on an earlier draft of this paper. However, he retains sole responsibility for any remaining errors. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the Institute.

1. Introduction

I am most honoured to contribute a short essay to this commemorative volume in remembrance of the late Prof. Dale W. Jorgenson. Prof. Jorgenson was my teacher, the principal adviser of my Ph. D. dissertation, mentor, collaborator, and friend. Almost all of the economics and econometrics that I know I have learnt from him, over an association of almost sixty years. Prof. Jorgenson made path-breaking contributions in many different areas of Economics, which are well known, and will not be repeated here. He was truly a giant in the profession. We all miss Professor Jorgenson.

In this essay, I wish to highlight the fact that Professor Jorgenson, together with Prof. Kevin J. Stiroh, were the first economists to show that the massive computerisation efforts of the 1960s and 1970s in the United States had resulted in significant gains in the productivity of the economy (see, for example, Jorgenson and Stiroh (1995 and 1999)). Computerisation, or more generally, digitisation, of the economy actually more than pays for itself eventually. We have also witnessed, over time, the continual significant decline in the costs of digitisation, as manifested through Moore's Law[2] and the increasing speeds of data communication, from 3G to now almost 6G.

The benefits of digitisation to an economy are readily identifiable. Digitisation has increased the volume, timeliness and accessibility of information flows, making the markets more efficient[3]. It has also increased the speed and accuracy of data processing, making "Big Data" usable for many applications. The Chatbot is one of the many resulting innovations. Digitisation has also enabled a greater degree of automation and robotics, finer and more precise quality control, greater and longer-distance division of labour, and a wider span of supervisory control. It has also significantly reduced search costs, standardisation costs, and transaction costs. It has made possible "just-in-time" logistics. The extent of fragmentation of production, which has characterised international supply chains, would not have been possible without digitisation. It is not an exaggeration to say that digitisation has significantly advanced both the pace and the scope of economic globalisation and international division of labour.

[2] Moore's Law, named after the late Dr. Gordon Moore, is the observed empirical regularity that the number of transistors in an integrated circuit (IC) doubles approximately every two years.
[3] For example, it has made possible "high-frequency trading". However, while it is privately profitable, there may be some disagreement as to whether it is socially productive.

An important aspect of digitisation is that it has huge economies of scale. "Big Data" is therefore a natural monopoly and needs to be publicly regulated and supervised. Left on its own, it can be the source of huge private monopoly profits at the expense of public welfare. Moreover, while I am a big fan of the distributed ledger (block-chain) technology which underlies crypto-currencies, crypto-currencies are a potential source of great financial instability in an economy because of its lack of regulation and transparency. A crypto-currency issuer is just like an unregulated and unsupervised bank that is free to issue any amount of its own money, similar to the private banks in the U.S. in the early Twentieth Century. It was the collapse of these private banks then that led to the prohibition of the issuance of money by private banks and the establishment of the Federal Reserve System in the U.S. Moreover, current users of crypto-currencies typically try to circumvent and evade government control, regulation and supervision, and engage in illegal activities such as money laundering, terrorism financing, drug dealing, tax evasion, and getting around capital controls if necessary. Furthermore, neither the "crypto" (non-transparent) nor the "mining" aspects of a crypto-currency add any net social value. Nevertheless, I believe the "block chain" technology has many potentially productive applications and I fully support the adoption, promotion and use of the "central bank digital currency".

Yet I have serious reservations on one particular aspect of "Big Data", that is, its ability to identify individual consumers and their respective behavioural characteristics. Very often, the so-called "Big Data" have been collected from individuals without their "free" and "voluntary" consents[4] and are then used, sold, or otherwise made available to other private organisations for profit-making purposes. There is little or no protection for the privacy of individual information. It is this loss of "anonymity" on the part of individual consumers and the potential mis-use of the information by sellers of products that may result in the appropriation of most of the consumer surpluses by the sellers.

[4] In actual practice, the individual typically has only the choice of either "consenting" or quitting the particular application or website.

2. The Potential Reduction in Consumer Welfare

A well-known efficiency condition for a competitive market for a product is price equal to marginal cost. However, the way information on individual consumers is collected and assembled by private organisations today means that the individual consumers are no longer anonymous. The potential sellers of products can identify their potential consumers as well as their respective consumption behaviour individually, and can exploit this information to maximise their profits. For example, if an individual consumer has a known history and pattern of buying high-priced luxury goods, a potential seller may be able to come up with a reasonable estimate of the individual's reservation price for a product, that is, the highest price that he or she is willing to pay, and try to offer to sell the product at this price, rather than at the marginal cost of producing the product. The difference between an individual's reservation price and the marginal cost is of course precisely the consumer surplus of the individual in a competitive market. The individual consumers may thus lose most of their potential consumer surpluses because sellers, armed with the information contained in the "Big Data", may be able to price-discriminate almost perfectly, and potentially appropriate almost all of the individual consumer surpluses. With perfect price discrimination, there is no "market" any more, only many one-on-one bilateral transactions, because the sellers will try to offer each consumer an individually specific price that approximates his or her reservation price. This is made much easier if the transaction takes place on the internet.[5]

Obviously, this outcome cannot be economically efficient even though it does maximise profits for the sellers, because almost all consumers will be paying more than the marginal costs for the products. This results in a significant decrease in the welfare of all consumers. To prevent this from happening, it is crucially important that the "Big Data" must be made anonymous to any potential seller of products, and this requires the enforcement of the privacy of individual consumer information in the absence of truly free and voluntary consents.

[5] Price discrimination can be practiced even with physical in-store sales. The store may offer discounts from the list price that depend on the customer. Knowledge on the potential customer is crucial.

3. Restoring Consumer Surpluses through Information Privacy

In order to reduce or prevent price discrimination on the part of the seller of a product, it is necessary that the seller not be given access to individual-consumer-specific information other than what is minimally necessary. Without individual-consumer-specific information, the seller cannot practice price-discrimination, and will have to quote a common price to all consumers, which will be equal to the marginal cost under competitive market conditions.

The first step towards this goal is to re-establish the privacy of individual personal information. Without the individual consumer's explicit and specific consent, a seller should be forbidden to collect information on the consumer other than what is minimally necessary for a transaction to be completed. Moreover, the seller should also be forbidden to make the transaction conditional on the individual consumer giving consent. This way, in principle, the seller will only have information on the particular transaction as well as any enabling identification details of the individual consumer such as name, home and email addresses, telephone number, and bank account and credit card numbers. Of course, the seller will be able to save this information in its database for use at a future date, which would be convenient for both the consumer and the seller.

The second step is to forbid any organisation, including the seller above, from disclosing, selling, renting, sharing or otherwise making available individual-consumer-specific information to any other party, except as required under a legal warrant issued by law enforcement authorities, without the individual consumer's explicit and specific consent. And no individual consumer can be denied service simply because he or she refuses to give consent to sharing data on him or her with a third party. Moreover, explicit and specific consent should be required for each organisation receiving the individual consumer-specific data. Courier service providers such as Federal Express and United Parcel Service will also be forbidden under this rule to sell or otherwise share any individual-consumer (or household)-specific information that they may have to other parties. This will limit the potential amount of individual-consumer-specific information that is available to any seller. Of course, any individual consumer is also free to give a wider or even blanket consent to the seller if he or she so wishes. In particular, the seller is free to offer money or other incentives to the individual consumer to try to obtain more information or consent. As long as it is non-coercive and entirely voluntary, it should be permitted.

The net result of the above proposal on personal data privacy is that in general a seller will not be able to know or estimate an individual consumer's reservation price with any confidence and hence will be unable to appropriate his or her consumer surplus through price discrimination.

4. Email and Other Communication Service Providers

The widespread use of email and other message application platforms operated by profit-making private enterprises also facilitates the collection and assembly of vast amounts of individual-consumer-specific private information, often without the explicit and specific consent of the individual consumer, information which can be used to his or her potential detriment, and in any event is a serious invasion of privacy. A not infrequent experience that an email user may encounter with some email service providers is the receipt of advertisement related to the contents of previously sent email messages, for example, planned out-of-town trips. This may be attributed to the business model of the email service provider which relies on the quantity of advertising which in turn depends on its perceived effectiveness.

As email communication is today no longer a luxury but a necessity of life, the internet should operate as a public utility, established and funded by the government, just like the post office. And just as the post office is not supposed to inspect the contents of the mail, at least not without a legal warrant, an email service provider should not be permitted to read the contents of emails or messages. Thus, no email provider should be able to maintain data on an individual user, and in particular to sell the information to third parties, without his or her explicit and specific consent. This should help to reduce scams on the internet.

5. The Inherent Economies of Scale of "Big Data"

"Big Data", by its very nature, has huge economies of scale and is inherently a natural monopoly. As such, it should not be left in the control of exclusively private hands, but instead should be publicly regulated and supervised to prevent its being misused to the detriment of public welfare. Ideally, "Big Data" should become a public utility, with open and non-exclusive access for all reasonable users. "Big Data" can be shared in the same way as data from a national census, with all individual personal and household identification marks completely removed. Ideally, "Big Data" should be managed and controlled by the

government, just like national census data, or by a public, non-profit organisation. This way, "Big Data" cannot be used as a tool for monopolisation and price discrimination.

What about private "Big Data", such as those amassed by applications like Instagram, Facebook and TikTok? Presumably these applications have already obtained consents from their users. However, they should not be permitted to sell or otherwise share their data with any third party without the explicit and specific consent of the individual consumer concerned.

6. Concluding Remarks

Is it too late for individual consumers to re-assert the privacy of their personal information? It is not yet too late. The preservation of the anonymity of individual consumers when they shop, on or off the internet, is essential to avoid price discrimination, and it can be done. The prohibition of the selling and otherwise sharing of data in the absence of consents should significantly improve personal information privacy. Email and other communication applications on the internet should be considered to be public goods, even though they were initially provided as private goods. Historically, there are many examples of initially private goods evolving into public goods because of over-riding public interests. For example, firefighting service used to be a private good, provided to only subscribing households, even though today it is almost universally a public good, provided by the local governments. Basic education used to be a private good, until it became mandatory. Mail delivery used to be a private good, provided by couriers, until its function was assumed by the central-government-financed post office. And issuance of money used to be done by private banks, until they collapsed and had to be rescued by the central government. Today, these services are all considered to be public goods, provided by the government. I believe the central government of each country should provide a no-frills email service, with guaranteed data security, at no or a nominal charge, for all.[6] [7] Individual consumers can choose to use whatever they want, a public system with information privacy, or a private system that makes use of their data for profits, or both. But they will have a choice.

[6] This is not the place to discuss whether the government is trustworthy. I only point to the U.S. Postal Service, which seems to have worked well since 1775, safeguarding the privacy of individual communication through letters in the U.S.

[7] Cross-border email service can be provided under an arrangement similar to that of the Universal Postal Union for letters.

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