

CHAPTER 2

Information, privacy and central bank digital currency

Todd Keister and Cyril Monnet

Rutgers University; University of Bern and Study Center Gerzensee

In a 2012 article in *The New York Times*, Charles Duhigg recounts the story of the father who was angry because Target, a store chain, had sent his teenage daughter coupons for baby clothes and other items appropriate for pregnant women. It turns out that statisticians at Target had been working on an algorithm that used purchase histories to assign a probability of being pregnant to each customer. The algorithm was correct; to her father's surprise, the teenage girl was indeed pregnant.

While it can be surprising how much information about one's personal situation can be inferred from purchase data, the reason Target developed these algorithms is perhaps more interesting. Duhigg explains that people tend to change their purchasing habits in defining moments of their lives, such as marriage or divorce, the start of a new job or – especially – the birth of a child. These events give retailers like Target an opportunity to attract customers as they set new spending patterns that will persist into the future.

DATA AND MONOPOLIES

That story broke in 2012. Fast forward to the present, where people increasingly shop on digital platforms such as Amazon. These platforms have massive amounts of data available to them. Their business relies heavily on data accumulation, both directly and through purchases, and data analysis. These data help build a network of customers, which in turn attracts merchants to the platform. The resulting activities then generate more data, which make the platform even more effective through a virtuous data-network-activities loop (Boissay et al. 2021). While the scale has increased and the techniques are more advanced, the goal remains the same as in Target's earlier efforts: attracting new customers and retaining them in a walled garden.

In recent years, digital platforms and other technology firms have been increasingly moving towards offering payment services, which provides them with an additional source of valuable data. The Covid-19 crisis has accelerated the shift from using cash, which provides some anonymity to customers, to contactless and other electronic payments, which do not. Payments data are often complementary to the information in purchase histories, as they provide insight into an individual's financial situation and spending patterns on other platforms and venues. Platforms can design increasingly

sophisticated models that combine these data with demographic information, as well as with data from other people with similar characteristics, to make inferences about individuals' preferences and willingness to pay for products.

While these advances may bring benefits to both consumers and the platforms they use, there are several reasons for concern.

The most obvious concern is that a concentration of data creates digital monopolies, which may stifle innovation and lead to higher prices as their power grows over time (Garratt and Lee 2021). A platform with more precise information about individual preferences and willingness to pay can price discriminate more effectively, offering different products and prices to different individuals. A platform that provides payment services can also discourage purchases on competing platforms, for example, by offering additional discounts or perks for purchases on the platform, or by charging fees for purchases made elsewhere. It is not difficult to imagine schemes that go further and try to 'poach' consumers who are poised to make a purchase on a competing platform (Fudenberg and Tirole 2000). For example, the payment system could offer a link to a similar item, or the same item at a lower price, on its own platform. This is even more problematic because, as customers, we have little control over who accesses the personal data we have agreed to share (Varian 1997). Overall, the ability to monitor and collect data on payment flows increases the advantage of an incumbent platform and limits the possible points of entry for competing platforms.

A second concern is less obvious but no less important: the algorithms used by platforms create externalities that lead consumers to underinvest in privacy. Consumers can limit the information they provide to platforms by, for example, changing their method of payment and taking steps to browse and shop anonymously where possible. In making these decisions, consumers weigh the inconvenience of taking these steps against the benefit of protecting their own privacy. However, as Garratt and van Oordt (2021) show, information that you disclose also allows platforms to make inferences about other people. Since you do not bear the cost of information you inadvertently reveal about others, you will tend to undervalue protecting your privacy from a social point of view. When everyone undervalues their own privacy, we all provide too much information to the platforms we use, which exacerbates the data monopoly problem.

A third concern arises in situations where the private value of information is higher than the social value, which leads platforms to over-invest in accumulating information about their customers. As first demonstrated by Hirshleifer (1971), additional information may have the perverse effect of undermining risk-sharing arrangements, an outcome known as the *Hirshleifer effect*. For example, lending platforms may use payments data to infer how the financial situation of individual borrowers is evolving, which would allow them to terminate some loans more quickly. While terminating loans that are less likely to be

repaid makes good sense for the lending platform ex post, this action can undermine the ex-ante risk-sharing benefits of the lending arrangement (Xiao 2021). The result can be less lending and the exclusion of some deserving borrowers.

Taken together, these concerns suggest there could be a role for public policy in guiding the amount of personal data accumulated in the course of economic activities, including making payments. Well-crafted and targeted regulation may be able to solve some inefficiencies. Given the time required to adopt and update regulations, however, directly regulating the fast-changing digital economy is a challenge. An alternative approach is to provide consumers with tools for managing their privacy. As Acquisiti et al. (2016) emphasise, “[p]rivacy is not the opposite of sharing — rather it is control over sharing”. The question is not about whether firms/platforms should be prevented from using data, but rather how customers can more effectively control the use of their data by platforms.

ENTER CBDC

One way the public sector might help tilt the balance of power away from digital platforms and back to customers is by making an electronic version of cash available to individuals and businesses. A central bank digital currency (CBDC) could allow consumers to make purchases in a way that does not reveal their identity to the seller, much like physical currency but in a more modern and convenient format. Introducing a CBDC could change the flow of information, and the resulting balance of power, in several ways. First, for some types of purchases, paying with CBDC would allow a customer to remain anonymous to the seller. A seller or platform that wants more information would then need to compensate customers for providing that information (Garratt and Lee 2021). In addition, using a CBDC would make it easier for consumers to keep their activity on one platform invisible to other platforms. Finally, setting the design features of the CBDC, such as the interest rate it pays, may allow policymakers to offset the externalities that lead consumers to underinvest in privacy (Garratt and van Oordt 2021).

While a CBDC would provide consumers with the option to keep their information private from retailers and financial institutions, at least some of that information would instead accrue to the central bank. Some observers worry that this new information could lead to an increase in government surveillance of individuals’ activities. However, emerging technologies may be able to provide consumers with privacy for relatively small transactions using CBDC, while enabling monitoring of larger payments in line with anti-money-laundering regulations (ECB 2019). Moreover, it is worth noting that the public sector has no clear motive to profit from consumers’ payments data in the way that private digital platforms do. For these reasons, a CBDC could effectively function as a convenient, electronic version of cash.

A FINANCIAL STABILITY BENEFIT

While a CBDC may be designed to provide privacy for many individual transactions, the central bank would still gain real-time information about the overall patterns of use and flows of the digital currency. Even relatively coarse information of this type could allow a central bank to better monitor the state of the economy in real time. This new information could lead to improved monetary policy decisions and quicker responses to changing economic and financial conditions, especially in periods of financial stress.

In Keister and Monnet (2021), we focus on one type of information a central bank may be able to infer from CBDC flows: the confidence depositors and other creditors have in their banks. In periods of financial stress, banks and other financial intermediaries have private information about both the quality of their assets and the willingness of their depositors and short-term creditors to continue to provide funding. A bank that is in a weak funding position will often have an incentive to hide this fact from regulators, at least for a while, to avoid triggering supervisory action. This combination of banks' private information and the incentive structure thus causes a delay in policymakers' response to an incipient financial crisis (Keister and Mitkov 2021). Such a delay can increase both the likelihood of a full-blown crisis and the severity of such an event.

In this situation, a CBDC could generate valuable information because it provides banks' creditors with an additional liquid investment opportunity. Suppose, for example, that a bank's short-term creditors learn that the quality of its assets has declined. Currently, if they wish to withdraw funding from the bank, they can shift their funds into another bank or into other liquid assets (for example, government bonds). These withdrawals from the bank might not be immediately observed by regulators and, even if they are, might be difficult to distinguish from the regular inflows and outflows generated by a bank's client transactions.

Once a CBDC is introduced, in contrast, the central bank has a new source of information: the flow of funds into this digital currency. We show that the central bank can use data on inflows into the CBDC to more quickly infer the state of the financial system and, perhaps, of individual institutions. This new information allows the central bank to respond more quickly to emerging problems.

One commonly raised concern is that by providing investors with a convenient, safe alternative asset, introducing a CBDC will make runs on the banking system more likely. This effect is present in our paper, but we show it is offset by the quicker policy response that a CBDC enables. When depositors and other short-term creditors know that the central bank will respond more quickly to an incipient crisis, they have less incentive to withdraw from their banks in the first place. In other words, the ability of the central bank to infer information about depositor confidence has the effect of increasing depositor confidence in equilibrium. In this way, the information a central bank would gain from using a CBDC can increase the stability of the financial system.

CLOSING THOUGHTS

Central bank digital currency has the potential to fundamentally change the flow of information generated by payments data. By providing consumers with a convenient electronic version of cash, it can give them better control in sharing their data. By creating a new source of information for the central bank, it can allow for quicker and more targeted responses to emerging financial strains, and thus help stabilise the financial system. How effectively a CBDC plays each of these roles will depend on a number of design choices that have yet to be made (Auer and Boehme 2020). In making these choices, central banks will consider other policy goals as well, such as improving financial inclusion and the effectiveness of monetary policy. A fundamental challenge ahead is identifying the design(s) that best allow a central bank to simultaneously meet this range of goals.

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ABOUT THE AUTHORS

Todd Keister is a Professor of Economics at Rutgers University. He has previously been an Assistant Vice President at the Federal Reserve Bank of New York and a Professor of Economics at ITAM in Mexico City. Todd’s research focuses on models of money, banking and financial stability, as well as on central bank policies. He holds a Ph.D. in Economics from Cornell University.

Cyril Monnet is a Professor of Economics at the University of Bern and at the Study Center Gerzensee. He has previously been an Economic Advisor at the Federal Reserve Bank of Philadelphia, and a Senior Economist at the European Central Bank. Cyril’s research focuses on monetary theory and the design of financial markets. He holds a Ph.D. in Economics from the University of Minnesota.