Deutsche Bank
Research

The Future of Payments

Part III. Digital Currencies: the Ultimate Hard Power Tool

#PositiveImpact

Part I. Cash: the Dinosaur Will Survive … For Now

Part II. Moving to Digital Wallets and the Extinction of Plastic Cards

Part III. Digital Currencies: the Ultimate Hard Power Tool

Corporate Bank Research January 2020

> My personal conviction on the issue of stable coins is that we better be ahead of the curve. There is clearly demand out there that we have to respond to.

ECB President Christine Lagarde

> I think the Internet is going to be one of the major forces for reducing the role of government. The one thing that's missing but that will soon be developed, is a reliable e-cash, a method whereby on the Internet you can transfer funds from A to B without A knowing B or B knowing A. The way I can take a $20 bill hand it over to you and then there's no record of where it came from.
>
> You may get that without knowing who I am. That kind of thing will develop on the Internet and that will make it even easier for people using the Internet. Of course, it has its negative side. It means the gangsters, the people who are engaged in illegal transactions, will also have an easier way to carry on their business.

Professor Milton Friedman in 1999, Nobel Prize winner

Summary on a Page

When people discuss the future of payments they tend to predict the end of cash. Our view is different. Not only do we think cash will be around for a long time, we see the transition to digital payments as having the potential to do no less than rebalance global economic power.

This piece is the third in a series of three pieces that examines the past, present, and future of the payments industry. We analyse the unexpected results of our proprietary survey of 3,600 customers across the US, UK, China, Germany, France and Italy and forecast trends in cash, online, mobile, crypto, and blockchain. The implications for customers and business are important; the potential macro and geopolitical consequences are profound.

We start by using the lessons of history to predict that cash will be a part of the economy for decades to come. Over centuries, people have developed a deep-rooted trust in paper and coins during uncertain times. Today is no different. For example, the trade war between the US and China has led notable investors to increase their cash holdings. Our survey shows that people also like cash because it allows them to more easily track their spending.

While cash will stay, the coming decade will see digital payments grow at light speed. That will lead to the death of the plastic card. Over the next five years, we expect mobile payments to comprise two-fifths of in-store purchases in the US, quadruple the current level. Similar growth is expected in other developed countries, however, different countries will see different levels of shrinkage in cash and plastic cards. In emerging markets, the effect could arrive even sooner. Many customers in these countries are transitioning directly from cash to mobile payments without ever owning a plastic card.

Digitalisation will give businesses extra incentive to smooth the payments transition. For starters, when customers are comfortable with a payment technology, they tend to think less about how much they spend. Furthermore, as the data gleaned from payments becomes increasingly valuable, payment fees will approach zero. Business-to-business transactions will also benefit. Currently, corporates wait almost 70 days for payment from business customers. The number one reason for this is inefficient internal processes which lead to payment delays, something digitalisation can fix.

We can deduce much about the future of payments from developments in China where the country is developing world-leading digital payments infrastructure. There, the value of online payments is equivalent to three-quarters of GDP, almost double the proportion in 2012. Today, just under half of in-store purchases in China are made via a digital wallet, way above the levels in developed markets.

As China (and India) develop electronic, crypto, and peer-to-peer strategies, the epicentre of global economic power could shift. China is working on a digital currency backed by its central bank that could be used as a soft- or hard-power tool. In fact, if companies doing business in China are forced to adopt a digital yuan, it will certainly erode the dollar's primacy in the global financial market.

Many are sceptical about digital currencies citing the large energy needs and point out that currencies such as bitcoin and Facebook's libra have encountered significant regulatory hurdles. Yet, if the growth in blockchain wallet users continues to mirror that of internet users, then by the end of the decade, they will number 200 million, quadruple the current level. This will be encouraged by governments, banks, corporates, and payment providers who all stand to benefit from the digitalisation of payments. And when countries and companies eventually look back at the way they transitioned to digital payments, it may become very apparent how they achieved their standing in the world economy.

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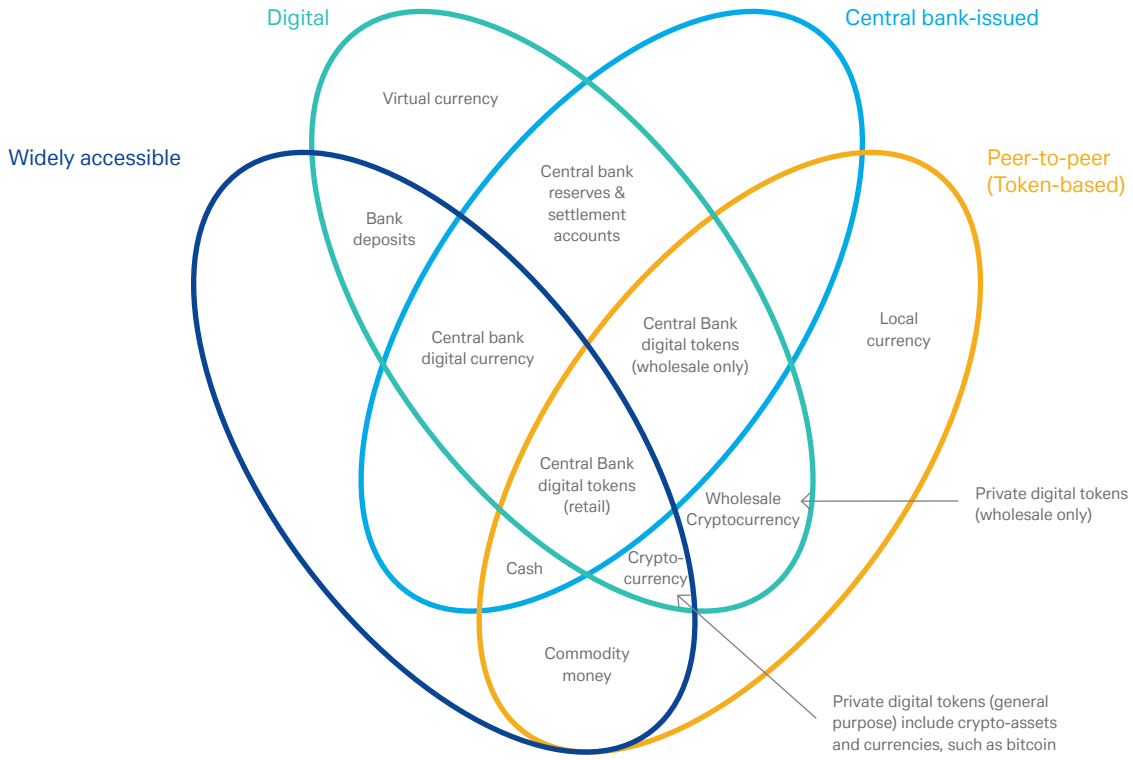
Introduction: From Globalisation to Decoupling

Still in their infancy, digital currencies have the potential to radically change payments, banking, central banking, and the balance of economic power. We have already moved away from the gold standard to fiat money, so why could we not take the next leap toward a digital currency?

Digital currencies (sometimes also referred as digital money, electronic money or electronic currency), either privately- or publicly-issued, are a type of currency available in digital form. Examples include virtual currencies, cryptocurrencies and central bank digital currency (CBDC). Digital money can either be centralized, where there is a central point of control over the money supply, or decentralized, where the control over the money supply can come from various sources.

The money flower: a taxonomy of money



Source: Adaptation from Bank for International Settlements (2017) based on Bech and Garratt (2017). Notes: The Venn-diagram illustrates the four key properties of money: issuer (central bank or not); form (digital or physical); accessibility (widely or restricted); and technology (account-based or token-based). Bank deposits are not widely accessible in all jurisdictions.

We believe a new digital currency could become mainstream within the next two years. In the long run, a digital currency could eventually replace cash (see our essay titled Cryptocurrencies: The Twenty-First Century Cash).

The main contestants for a mainstream digital currency, at this time, are Facebook's libra and the Chinese government's digital currency. Facebook, with nearly 2.5 billion users (one-third of the world's population), and China, with more than 1.4 billion inhabitants, have the potential to advance digital currencies into the mainstream.

1 The Bank of International Settlements defined three examples of current technological and design features of crypto-assets relative to other traditional assets: (1) they are digital and virtual in nature; (2) they rely on cryptography and advanced mathematical techniques to restrict the transmission of data to the intended parties; (2) they use distributed ledger technology.

Facebook announced its proposed cryptocurrency and payment system, libra, in June 2019. The launch had been planned for early 2020 but it now seems that the end of 2020 or later is more likely.

At the end of 2019, the Chinese government, without a formal announcement, stated it would be launching a People's Bank of China (PBoC) digital currency. The plans were finalised and approved in October 2019, so a pilot launch at the end of 2020 seems plausible. If this materialises as expected, China will become the first major economy to use a digital currency. That will pressure other countries to set up their own digital currencies. A government-issued digital currency could be a powerful political and economic tool for China.

To break into the global payment market, digital currencies must overcome some headwinds and forge alliances with key stakeholders. These might include mobile payment apps (Alipay, WeChat Pay, Apple Pay, Google Pay), card providers, and worldwide retailers (Alibaba, Amazon, Walmart). Assuming that (a) governments back them; and (b) they become stable; and (c) consumers and merchants can get more value by using these new currencies, then increased adoption rates will more rapidly lead to mainstream use. We are still in the early days of change, but if current trends continue, there could be two hundred million blockchain wallet users by 2030.

Our exclusive survey of 3,600 customers in China, France, Germany, Italy, the UK, and the US found that millennials envision a purely digital currency. A large majority of millennials believe cryptocurrencies will be good for the economy and said they have already bought and sold a cryptocurrency. More than a third of millennials believe that cryptocurrencies are already replacing cash.

The final section of this report focuses on factors that promote and hinder the adoption of cryptocurrencies. We present an overview of how private and government sectors are embracing (or not) this new technological reality. Finally, we consider what the global economy will look like if (or when) a digital currency emerges in China.

Current Adoption Rates of Cryptocurrencies: Age and Cultural Factors

For investors, crypto-assets have numerous advantages compared to traditional assets, which could lead more and more people to use cryptocurrencies. First, they could offer a low or negative correlation with financial assets, meaning they might not be driven by interest rates. Second, they can decompose composite returns, thereby offering a more precise exposure to alpha return components; that is, they can enable people to trade a revenue stream that comprises a share price/ROE, somewhat like securitisation. Third, a cryptocurrency can enable individual assets to be compiled into a composite asset for better return profiles, like a "composable token" or SET protocol. Fourth, cryptocurrencies can fractionalise financial assets for accessible investments.

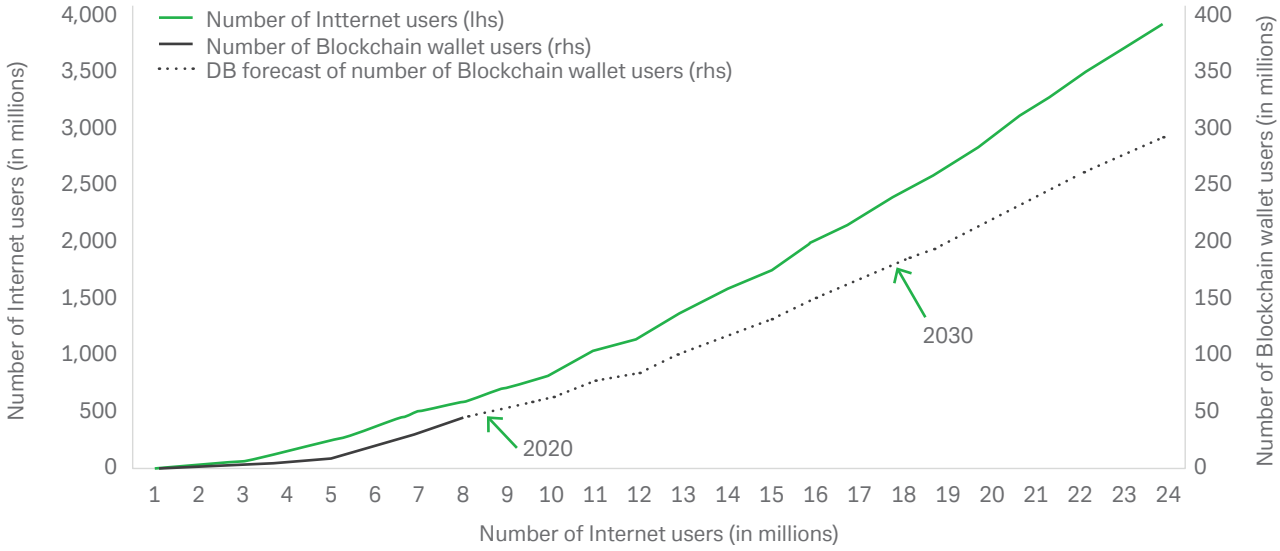
Cryptocurrencies have been around for about a decade, but it was not until 2017, when bitcoin's price surged to nearly $20,000, that they grabbed significant global attention. If we connect the dots between the dematerialisation of payments and the rise of cryptocurrencies, we can envision a near future in which cryptocurrencies gain broad acceptance. This view is supported by trends among young generations who readily accept digital currencies and payments.

Overall, though, relatively few people have bought and sold cryptocurrencies. They are largely seen as a supplementary means of financial transactions rather than as necessary or advantageous substitutes for mainstream methods. They have not been widely accepted as a means of payments despite their well-known benefits: security, speed, minimal transaction fees, ease of storage, and relevance in the digital era.

Today's adoption rates could, and likely will, change. If the Chinese government, along with Google, Amazon, Facebook, or Apple (the so-called GAFA group), or a Chinese company like Tencent can overcome some of the barriers to cryptocurrencies (discussed later), then cryptocurrencies could become more appealing. This will hasten their adoption and give them the potential to replace cash.

The chart below shows the adoption rate of blockchain wallets as compared to the adoption rate of the Internet. At least for now, the curves are similar after adjusting for scale. If current trends continue, there could be two hundred billion blockchain wallet users by 2030.

Adoption rates of cryptocurrencies and the Internet



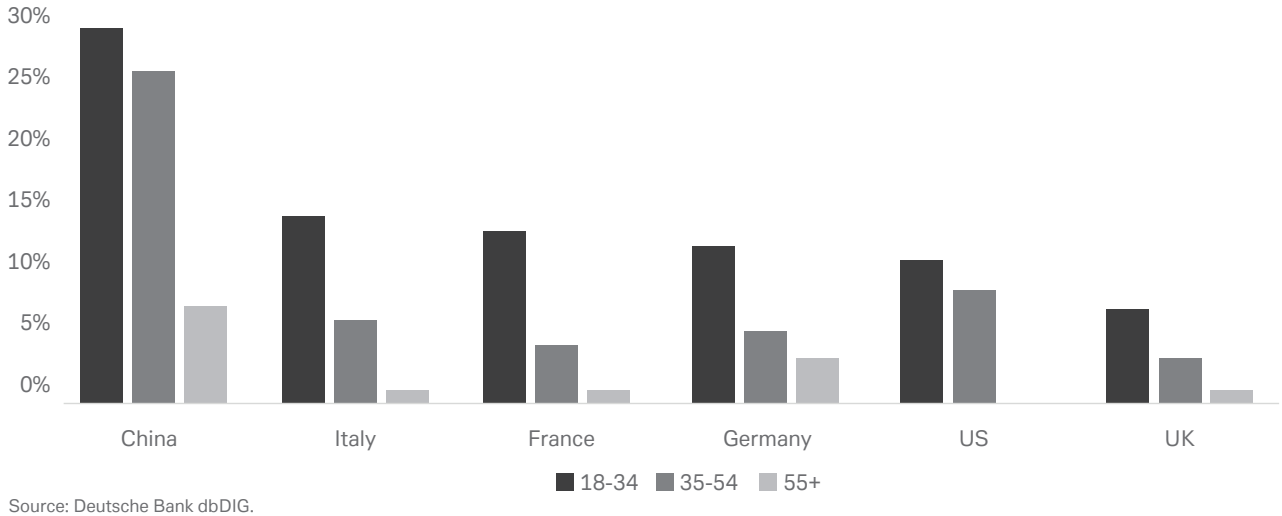
Sources: Deutsche Bank calculations, InternetWorldStats.com, and Blockchain.com. We measured "adoption rate" by the number of users adopting the Internet and bitcoin since each went public. In this case, the Internet and bitcoin have been public for different lengths of time. The Internet has been around since the 1980s but went public in 1991. Bitcoin was launched in 2009 but it became publicly accepted in 2011. Year one for the Internet is 1991 and for bitcoin it is 2011. To forecast the number of blockchain wallet users, we applied the growth rate of the number of Internet users.

With those broad perspectives in mind, we can then look more closely at the adoption rates as affected by age and culture.

Comparing the Perspectives of Young and Old

The current adoption rates of cryptocurrencies are influenced by generational views, as shown in the graph below.

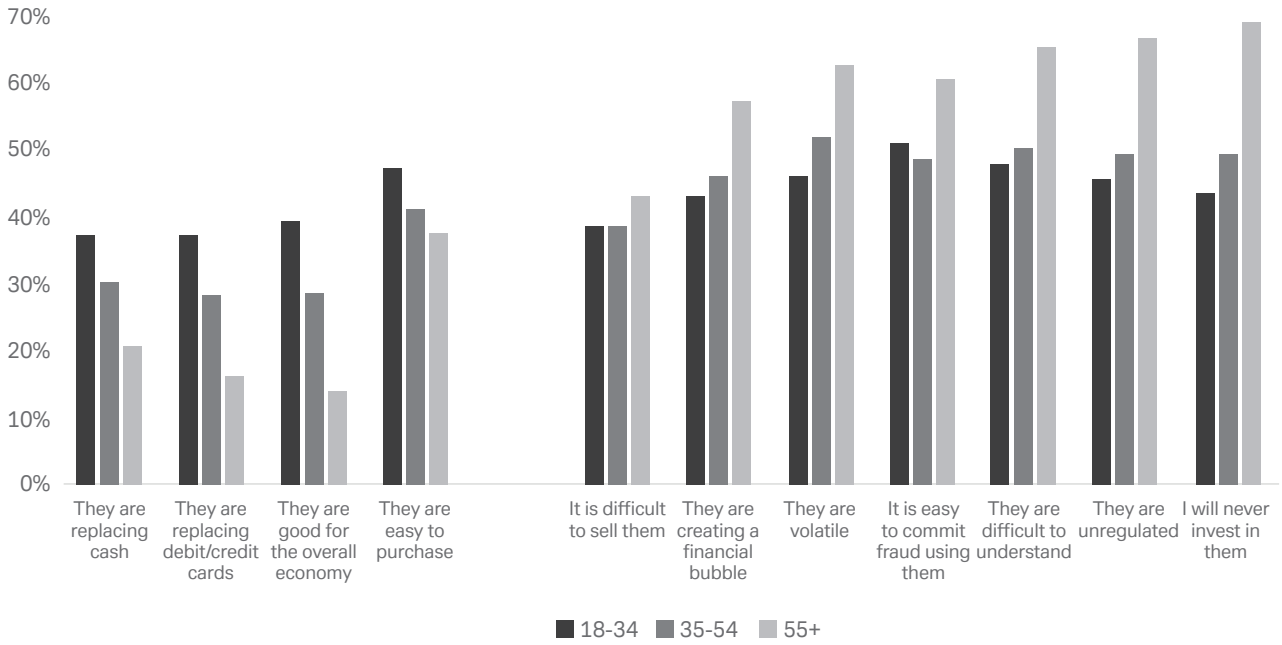
Citizens who have bought or sold cryptocurrencies



Source: Deutsche Bank dbDIG.

Looking more closely at generational influences on adoption rates, our proprietary survey revealed three main barriers preventing a move from cash to cryptocurrencies. Each is related to age. Older people surveyed had more fears about cryptocurrencies, found them harder to understand, believed they create volatile financial bubbles (like the dotcom bust), and saw them as low-liquidity financial instruments. A third of those surveyed had no idea how cryptocurrencies work, and 40 percent only had a partial understanding. As you can see below, we found a stark contrast between older and younger people, with the latter expressing more positive views about cryptocurrencies.

Citizens who agree with the following statements about cryptocurrencies



Source: dbDIG Deutsche Bank Research. Note: include China, France, Germany, Italy, the UK and the US.

Privacy vs. Convenience: Cultural Perspectives and Adoption Rates

The adoption rates of cryptocurrencies are also influenced by cultural perspectives. The central cultural question surrounding cryptocurrencies is related to the tension between privacy and convenience.

Banknotes and coins greatly reduce digital footprints. A cash transaction does not generate digital data. Therefore, no third party, such as a payment provider, will automatically receive transaction data, thereby increasing individual privacy.

However, as we discussed in Part II. Moving to Digital Wallets and the Extinction of Plastic Cards, consumers have a strong preference for digital payments, primarily due to greater convenience. Cards and smartphones, for example, eliminate the need for carrying cash and coins. Merchants don't need to use armoured trucks to take cash to the bank each day.

Perspectives on these two poles—privacy vs. convenience—vary from culture to culture. Interestingly, our survey shows that citizens in advanced economies are more worried about privacy than people in emerging economies. According to our survey, Americans (22 percent), British (21 percent), French (29 percent), Germans (42 percent), and Italians (19 percent) reported concerns about anonymity and traceability. A tenth of Chinese reported similar concerns.

The tension between privacy and convenience could diminish as the global population across all cultures becomes more knowledgeable about how cryptocurrencies and blockchain technologies work. That's because cryptocurrencies promise to enable financial transactions that are both digitally convenient and individually private.

Regulatory, Economic, and Technological Factors

In addition to age and cultural perspectives, other technological and regulatory factors play a major role in how widely digital currencies will be used around the world. In this section, we look more closely at barriers that must be overcome if digital currencies are to be used as mainstream forms of financial transactions.

Regulatory Concerns

Regulatory reviews have identified numerous risks related to cryptocurrencies, but liquidity, custody, anti-money laundering (AML), and security are the most prominent. Specifically, private cryptocurrencies significantly increase the risk of financial crime (e.g. AML, KYC, bribery, sanctions, and tax evasion). We expect that technological solutions and regulation will evolve to sufficiently address this concern.

Another risk—market manipulation (of price and volume)—is already known to occur. Furthermore, people can cash out illegal gains made with a cryptocurrency very rapidly, even across borders, which presents law enforcement agencies with jurisdictional complications. Then there is the problem of complex layering. People can transfer bitcoin to zcash to ether and then trade using an ether-to-dollar contract in order to cash out in a third jurisdiction. This approach can be very portable even though the crypto-asset is pseudo-anonymous.

No cryptocurrency will ever be able to emerge as a mainstream payment solution without approval from regulators. Governments have already started regulating cryptocurrencies around the globe, both in advanced and emerging economies. In the United States, the Internal Revenue Service issues decisions on how bitcoin earnings should be taxed, and bitcoin wallets must now comply with anti-money laundering rules.

Last year's announcement of Facebook's libra spooked the world's major central banks into swift action. Jerome Powell, the US Federal Reserve chairman, in congressional testimony less than a month after libra's introduction, said this proposed currency raised "many serious concerns regarding privacy, money laundering, consumer protection, and financial stability." He stated the Fed's view that libra cannot be allowed to go forward. Other central banks followed suit, with Christine Lagarde, the ECB president, warning that cryptocurrencies are "shaking the system." This constant friction between fintech innovation and regulatory efforts is likely to be an ongoing concern.

One reason for small recent gains in cryptocurrency use is the privacy they offer. For several years, people believed that bitcoin could facilitate anonymous transactions beyond governments purview. However, blockchain does keep track of transactions; it just doesn't reveal them publicly. Governments can use other information to reconcile any transaction and obtain identities, something that is particularly useful for anti-money laundering requirements and for identifying criminal use.

End-to-End Financial Infrastructure

Today, cryptocurrencies are not widely accepted by retailers and buying cryptocurrencies with a debit or a credit card remains difficult. Therefore, in order for cryptocurrencies to achieve global reach in the payment market, alliances must be forged with key mobile payment apps, card providers, and retailers. The Chinese digital currency could be used across major payment platforms, including WeChat Pay, Alipay, and UnionPay. It is strategically positioned to become de facto a global digital currency in emerging economies.

We could easily envision Facebook using an upgraded version of libra—or any other cryptocurrency initiated by Google, Amazon, or Apple—to establish a global cryptocurrency. Facebook operates through social networks on a global scale and benefits from its own ecosystem of services, including WhatsApp, Instagram, and Facebook Messenger. Several merchants and video games are selling directly through Facebook. Facebook launched a new payments system in November 2019 called Facebook Pay available across Facebook, Messenger, Instagram, and WhatsApp. Libra could be used for all of Facebook's services (directly or through a Facebook fixed exchange rate). Its initial stakeholders were Mastercard, Visa, Stripe, PayPal, Uber, and Spotify.

Economic Stability and Reliability

Unless governments interfere, cryptocurrencies will likely lack price stability, making them risky to hold and invest in. Bitcoin has strongly fluctuated over the past few years. According to Blockchain.info, the average USD market price across major bitcoin exchanges fluctuated between $177 and nearly $20,000 between January 2015 and December 2017.

Such dramatic price fluctuations make it hard for bitcoin to function as a stable store of value or as a means of exchange. It conjures memories of hyperinflation in Germany in 1920s and more recently in Argentina, Venezuela, and Zimbabwe. Imagine how hard it would be for e-retailers to set up a price for their goods in bitcoin. A used car could have been worth 110 bitcoins in early 2015 and only 1 bitcoin in December 2017!

Currency is also a unit of account for debt. Yet, bitcoin's large price fluctuations make it hard to even think about financing a small transaction, let alone a large transaction such as a house, with cryptocurrency debt. In 2017, the price of bitcoin-denominated debt would have risen tenfold. However, because salaries are paid in dollars, euros, or other currencies, they have not grown as rapidly. As a result, had bitcoin been widely used, the last year might have been massively deflationary.

Bitcoin is too volatile to be a reliable store of value (market price in USD)

Source: blockchain.info. Note: Average USD market price across major bitcoin exchanges.

People are working on ways to add more stability to privately developed cryptocurrencies with "stablecoins." Their value can be pegged to an existing asset, such as a commodity, or to a fiat currency for transaction and settlement processing on a DLT-powered business network with fewer legacy infrastructure expenses and operational costs. Since 2017, around 120 stablecoins have been created including Tether, which is the largest stablecoin. But this represents only 2 percent of bitcoin's market capitalisation. When we consider libra, it could use stablecoins pegged to fiat currencies like the dollar, the euro, and sterling.

Energy Consumption

Another important concern that could hinder widespread use of cryptocurrencies is related to energy consumption. The electrical energy required for "mining" cryptocurrencies is astounding. And because energy use increases proportionally with the cryptocurrency's market valuation, there are numerous alarms about the environmental impact of cryptocurrencies. One factor that might mitigate this is if capital currently engaged in the cryptocurrency market is be used to develop green technological advancements. This would act as a positive externality; that is, technological innovation in the financial sector that drives innovation in the energy sector.

The Possibility of Sovereign Digital Currencies

What if central banks become more daring and start creating cryptocurrencies? A central bank cryptocurrency would provide an official form of money backed by the government and the capacity to exchange peer-to-peer without intermediaries (commercial banks). Cryptocurrencies utilise distributed ledger technology (DLT) to allow remote peer-to-peer transfer of electronic value in the absence of trust between contracting parties.

A central bank cryptocurrency could take two forms: (a) a widely accessible electronic currency available to the public for retail transactions; or (b) an electronic currency restricted only to large business transactions. The retail form of a central bank cryptocurrency would play the same role as any currency in circulation today, whereas the wholesale form would be like the reserves held by banks and other financial institutions. As with a traditional currency, it would be decentralised in transaction and centralised in supply.

Key design features of central bank money

	Existing central bank money		Central bank digital currencies		
	Cash	Reserves & settlement balances	General		Wholesale only token
			Token	Accounts	
24/7 availability	✓	×	✓	(✓)	(✓)
Anonymity vis-à-vis central bank	✓	×	(✓)	×	(✓)
Peer-to-peer transfer	✓	×	(✓)	×	(✓)
Interest-bearing	×	(✓)	(✓)	(✓)	(✓)
Limits or caps	×	×	(✓)	(✓)	(✓)

Source: Bank for International Settlements (2018). Note: ✓ = existing or likely feature, (✓) = possible feature, × = not typical or possible feature.

Central bankers[2] have started to consider digital currencies as a new tool. Why would a cryptocurrency be more desirable than the reserve system in place today? What are the advantages for end users and central bankers?

Advantages for End Users

A central bank cryptocurrency could offer three main benefits: reduced risk of identity theft; increased efficiency in securities settlements and cross-border payments; and better currency stability.

First, it would reduce the risk of identity theft, of being tracked by a dangerous counterparty or direct advertiser, and of being spammed. Today's intermediated digital payment systems allow too much private information to be revealed to third parties (e.g. commercial banks). DLT would alleviate the problem.

Second, a central bank cryptocurrency would increase the efficiency of securities settlements and post-market activities. Today's security clearing and settlement process has a multi-day lag. The DLT of a cryptocurrency promises immediate securities clearing and settlements. This would increase efficiency and reduce associated reconciliation costs.

2 For example, the Riksbank—the Swedish central bank—launched in 2017 its e-krona project and reported on how to straddle the difficult line between anonymity, public backing, and compliance with anti-money laundering laws and regulations designed to prevent the financing of terrorism.

Third, a cryptocurrency could also act as a more stable currency, especially for emerging economies which can experience higher currency volatility than advanced economies. Compared to the volatile nature of cash's purchasing power (caused by fluctuations in the price level), a cryptocurrency could be built in a way that maintains the real value of money. That would stabilise the holder's purchasing power. For example, under an indexation scheme, the nominal value of an individual's cryptocurrency holdings would increase temporarily during periods of above-target inflation.

Advantages for Central Bankers

Following the 2007-2008 financial crisis, the central banks of advanced economies cut interest rates. So far, only a few central banks have set negative interest rates. Introducing a fully digitalised currency (not necessarily a cryptocurrency) would eliminate the risk of cash hoarding, since cash would likely stop being used after the "full" introduction of a digital currency.

Central banks could rely on the currency interest rate as its primary monetary policy tool and thereby avoid using controversial, unconventional tools such as quantitative easing. This would substantially improve a central bank's ability to stabilise business cycles.

Finally, interest-bearing digital currencies could enhance competitiveness in the banking sector. People would have the option to move bank deposits into interest-bearing digital currency accounts at the central bank. Allowing the public to hold cryptocurrency accounts at central banks would resolve many problems caused by the current fractional reserve banking system. For example, the central bank would not be vulnerable to bank runs, and governments could stop providing deposit insurance and bailouts to institutions deemed "too big to fail." By doing so, moral hazard problems on the part of banks would be greatly reduced.

The use of DLT, however, has risks. According to the Bank for International Settlements, "in most instances, the risks associated with payments, clearing, and settlements are the same irrespective of whether the activity occurs on a central ledger or a synchronized distributed ledger. That said, DLT may pose new or different risks, including: (1) potential uncertainty about operational and security issues; (2) the lack of interoperability with existing processes and infrastructures; (3) ambiguity relating to settlement finality; (4) questions regarding the legality of DLT implementations; (5) the absence of an effective and robust governance framework; and (6) issues related to data integrity, immutability, and privacy. DLT is an evolving technology. It has not yet been proven to be sufficiently robust for wide-scale implementation."

Implications for Corporations if a Chinese Digital Currency Emerges

What Corporations Can Do

Corporations that want to cater to a diverse market need to offer a variety of purchase options. For this reason, customised loyalty apps are popular at major chains. This type of payment system can easily be developed for any company by purchasing basic technology tools. For example, QR codes and social wallets are popular in China, where people use WeChat Pay and Alipay.

Applications can optimise business logistics, personalise customer experiences, and provide data needed for making decisions. For certain businesses, going cashless and adopting the newest technologies can significantly reduce operational overhead, increase productivity, and help with logistics. Software is available for business owners to access data in real-time from mobile devices and generate customisable reports.

As cryptocurrencies become more widely adopted, corporations will need to ensure they can handle new payment methods and offer a variety of crypto-based payment options. Corporations will need to analyse their target markets to understand which cryptocurrency is most viable for their products and customers. Corporates will need to select an exchange, such as Coinbase or BitPay, and encourage their prospects to adopt one. Then corporation may need to advertise that it accepts cryptocurrencies.

The legal implications of allowing cryptocurrency payments can be complex. In certain industries, such as financial services and pharmaceuticals, local governments may require the merchant to validate the identity of the customer. This could be more difficult with cryptocurrencies. Companies will need to establish the infrastructure to conduct a thorough legal and compliance analysis related to customer identity, taxation, liquidity, or other regulated issues. Following on from this, accounting and cashflow systems need to be adapted, especially if the company will be holding cryptocurrency for an extended time and wants to recognise it as revenue.

Worlds Apart: Decoupling or A Tale of Two Halves

The People's Bank of China started to conduct research on cryptocurrency as early as 2014 on a project called "DC/EP," (Digital Currency / Electronic Payment). Beyond replacing cash, the long-term goal of the PBoC's digital currency could be to improve the efficiency of transactions across the financial system.

Recently, due to the US-China trade war and Facebook's announcement of libra, the Chinese government sped up its efforts. In late October 2019, Chinese President Xi Jinping endorsed blockchain as "an important breakthrough for independent innovation of core technologies" in a meeting of the Political Bureau of the Chinese Communist Party's Central Committee. He has since repeated the PBoC's intention to replace cash with a central bank digital currency.

The People's Bank has not communicated what the technology behind its digital currency will be.[3] Despite that, it is likely that China's national digital currency plan will be fully backed by the central government and pegged one-to-one to the Chinese renminbi.[4] Since the DC/EP is not tied to a bank account, the currency enables users to have anonymous transactions, which could offer the same advantage as libra in terms of digital payment. "The new digital currency will spot certain behavioural patterns using big data and identify the users" so the technology can "help the government crackdown on money laundering, tax evasion, and financing terrorist groups."[5]

3 However, because of the president's recent speech on the importance of blockchain, some have predicted that the currency will be based on blockchain. The central bank would probably prefer to be in control of the database, so that only it can view all transactions and edit records. Some have called this a "private, permissioned" form of blockchain.

4 China's digital currency will be purely renminbi-backed while libra is likely to be backed by a basket of currencies. China's digital currency will fall under the renminbi's capital controls, which restrict how much can be taken out of the country while Facebook's explicit intention is that libra will be used around the world.

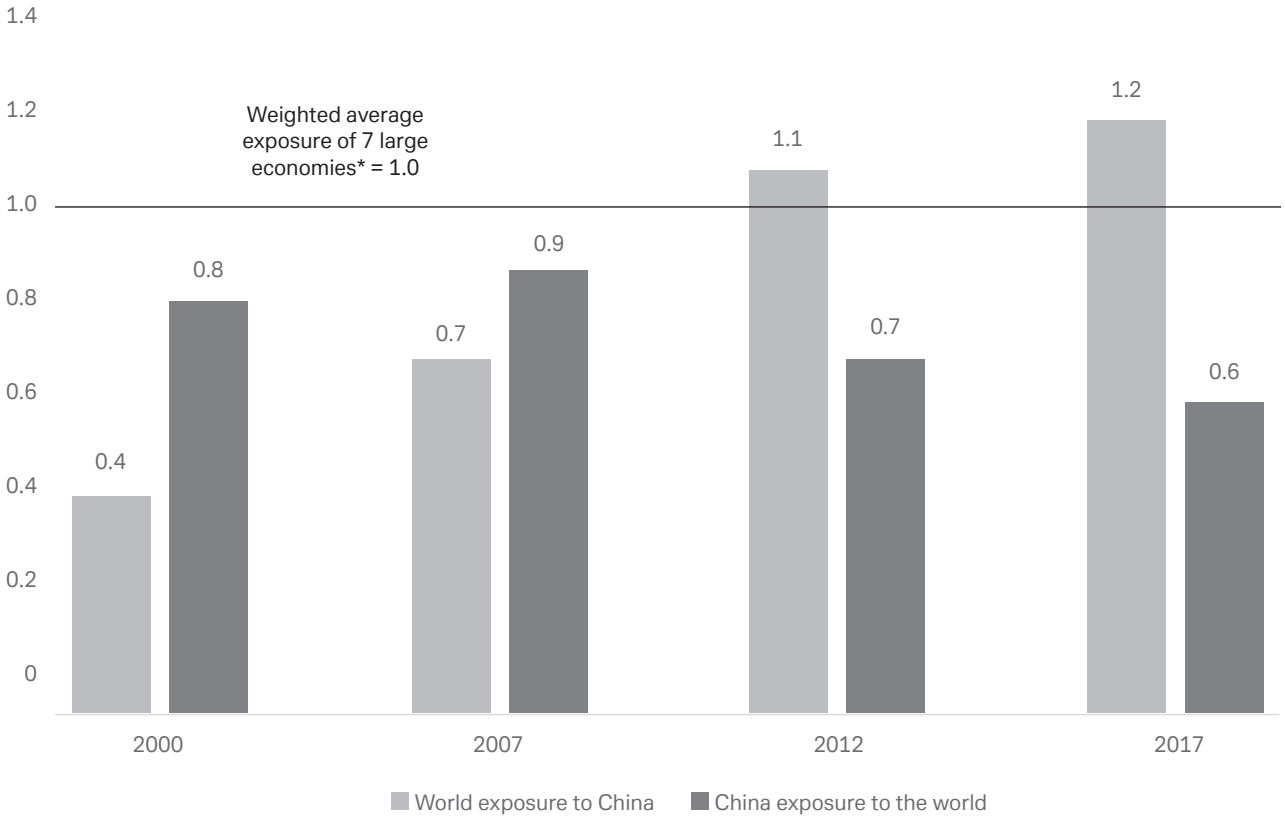
5 According to Changchuan Mu, the new director of China's Research Institute on Digital Currency.

The next question is what a state-backed digital currency would mean for the renminbi's internationalisation. If we only consider the digital currency itself, it probably will not change much. However, looking at the broader context, the relationship between China and the world is changing and China may follow the market recipe to help make the renminbi a dominant currency.

First and foremost, assuming the US does not ban libra, and other central banks loosen regulations over time, it seems likely that libra will become a dominant international currency. Until now, the dollar has generally remained the unipolar centre of the international monetary system despite widespread emerging markets crises in the 1990s and the financial upheaval of the late 2000s. We could easily envision a few extreme cases in which a country could fully embrace libra (e.g. Zimbabwe, with its recent history of rampant inflation, announced last year that it welcomes any alternative currencies). Even if Facebook is blocked in China, people could use indirect ways to purchase it from abroad.[6] And if libra is the only digital and mainstream currency, this is likely to reinforce the "dollar dominance."

Second, the launch of China's digital currency gains global significance because of China's standing as the world's second largest economy. China's share of world consumer spending increased from two per cent in 1980 to 12 per cent in 2018 in dollar terms. That puts China on track to become one of the world's biggest consumer markets before the end of the coming decade. Indeed, it could reach or even surpass the size of the US and EU markets. It is also the largest world exporter of goods since 2009 and the largest trading nation in the world. China has been reducing its relative exposure to the world while the world has been increasing its exposure to China.

China-World Exposure Index (trade, technology, and capital)

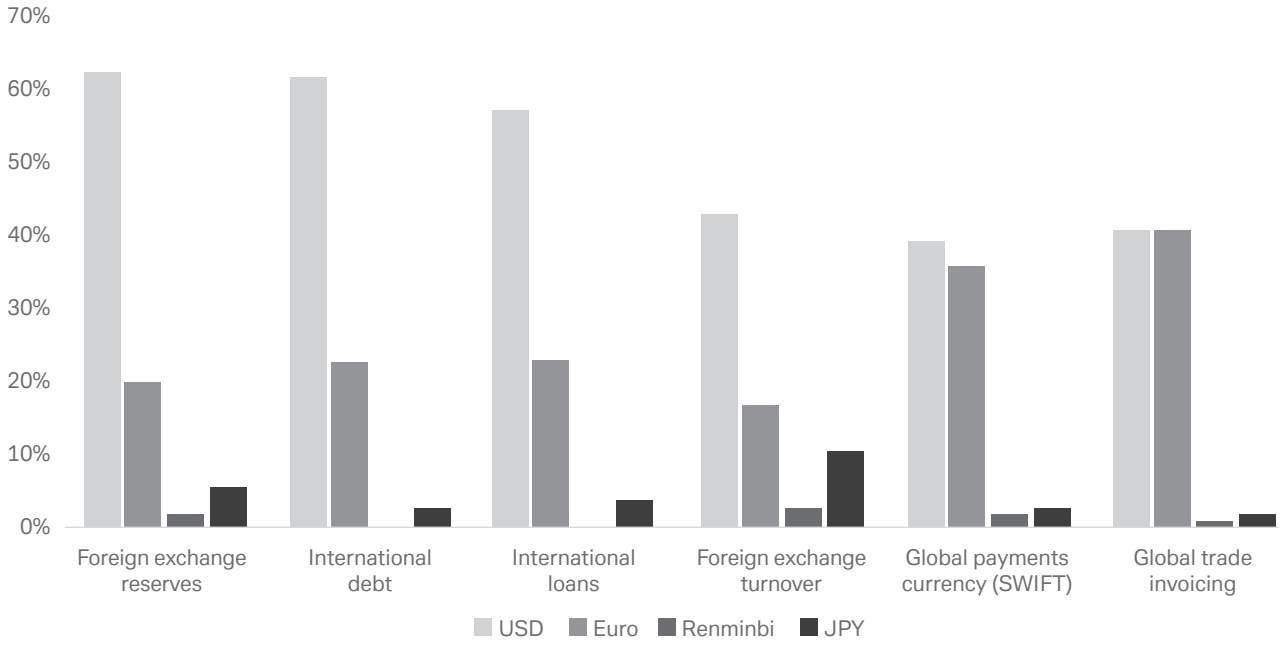


Source: McKinsey Global Institute analysis. Note: *China, France, Germany, India, Japan, United Kingdom, and United States.

The Chinese government has made tremendous efforts to internationalise the renminbi, similar to the US intervention in the early twentieth century. From 2000 to 2015, the RMB share as a settlement currency in China's trade has increased from zero to 25 percent. The renminbi has now surpassed the euro, the second most-used currency in global trade, but it is still far behind other major currencies in international financial transactions unrelated to trade. There are different ways to calculate the below figure but the US dollar largely dominates in foreign exchange reserves and as the global payment currency.

6 There are still some agencies that use virtual private networks (VPNs) to buy bitcoin from foreign exchanges.

The dollar remains the dominant currency in the international monetary system (percent)



Sources: Benoît Coeuré (2019) based on BIS, IMF, SWIFT, Gopinath (2015) and ECB calculations.

China aims to become a world leader in science and innovation by 2050. China is also massively investing in advanced technologies and is currently the second largest investor in artificial intelligence enterprises after the US. Indeed, China appears on track to have an "AI ecosystem" built by 2030. China's R&D expenditure surged from about $9 billion in 2000 to $293 billion in 2018 (the second-highest figure in the world behind the US). China benefits from advanced payments systems (especially settlement technologies) that could change the deal and attract merchants and vendors to use this new, more efficient currency.

China is gaining a decisive advantage over financial applications that use DLT. This will likely disrupt the GAFAMs, which have prospered with the help of the personal data of customers. Whoever dominates a blockchain will control the trust of users on that platform. Whoever dominates the first major state digital currency will control the banking and e-commerce sector within that nation (at least).

That being the case, our question here is not which currency dominates the global economy, but how to minimise the adverse effects of non-government cryptocurrencies, such as criminal activity or terrorism. Government-backed cryptocurrencies could deter international and national financial fraud. The global underground economy—tax evasion, criminal activities, terrorism—is much smaller than the legal economy (perhaps one-fifth the size), but such lawless activity is highly consequential. But if the US were to launch its own government-regulated digital currency, all transactions using US dollars could be traced by US authorities. For example, if any enemy nation were to use it to finance illegal activity, they would run a high risk of being caught and blocked.

And where interests diverge and do not coincide from those in Western countries, having a state-backed digital currency can prove useful. Of course, Western regulators could ban the use of the Chinese state-backed digital currency but it would not prevent it from being used in other emerging economies (Asia, Africa and Latin America) which could in turn generate underground demand in Europe and the US.

Regulators worldwide have prescribed the use of cryptocurrencies in banks and retail establishments. When all transactions could become digital, every exchange of goods or services for money can become known by authorities.

These effects for a currency, such as libra, are currently being worked through. libra, which is designed as a "permissioned" currency, is registered and regulated in Switzerland. Despite Switzerland's historical banking traditions, cooperation between the US and Switzerland may be greater than between the US and China.

Libra will be based on a basket of reserve currencies, including about 50 percent in US dollars. Because all dollar clearings must go through US-regulated entities, libra use will certainly give additional insights to US authorities.

That means that in the medium term, US dollar dominance should continue and the renminbi is unlikely to overtake the dollar anytime soon. Among other reasons, China's capital controls, and its limits on foreign holdings of bonds and equities will likely hold the renminbi back from supplanting the dollar in the global economy. That said, there is no doubt that the renminbi is gaining momentum on the global scale.

In the long run, if the trade deficit between China and the US widens far enough, a point could be reached where the dollar, euro, and renminbi share the global reserve currency spotlight. In that case, the renminbi could eventually dominate the other currencies. Moreover, a commitment from Chinese authorities to liberalisation efforts and further development of local capital markets, and more convenient payments technology, like Alipay or WeChat Pay, could catalyse greater international use of the renminbi.

Conclusion: Are Cryptocurrencies the Twenty-First Century Cash?

Our twentieth-century payment system needs to be upgraded and digitised. Governments, particularly those in Western countries need to wake up before it is too late. That is because a private, loosely regulated digital currency is probably not the best response to the coming financial disruption. Rather, cryptocurrencies need to overcome three main hurdles to become widespread and that requires a degree of government planning.

First, they must become legitimate in the eyes of governments and regulators. To win that legitimacy, cryptocurrencies must achieve price stability and offer advantages to merchants and consumers. They must also allow for global reach in the payments market. To do this, alliances must be forged with key stakeholders: mobile apps, card providers, and retailers. If these challenges—and others, such as energy consumption—can be overcome, the future of cash is at risk.

Even if these requirements are met, new challenges could also arise. For starters, what might it mean to establish a robust digital financial system entirely on a foundation of electricity consumption? To envision a smooth transition toward a fully digitalised platform, the financial system needs to overcome an electricity shutdown or cyberattack. Governments might need to safely store backups of citizen data in another country. Estonia, for example, chose Luxembourg to store a comprehensive backup of government data, including details of its citizens' health, population, business registries, and even a data embassy.

Natural disasters, climate change, and global warming are also concerning. Disasters are infrequent, but they can be crippling. In 1989, Quebec was plunged into darkness for nine hours because of a solar flare. Cyberattacks are becoming more frequent. In January 2018, the Tokyo-based cryptocurrency exchange Coincheck reported that hackers had taken GBP 400 million. Even though transactions for many cryptocurrencies are public, all 523 million stolen coins ended up in nameless accounts.

As we look to the decades ahead, we should not be surprised if a new cryptocurrency were to unexpectedly emerge. Some countries with historically strong banking industries are considering cryptocurrencies. In addition, cryptocurrencies could pass through countries with more secretive banking systems. Cryptocurrencies could be a powerful tool for a digital war. The question is which country will take advantage of being the first to obtain licenses and build alliances. As that occurs, the line between cryptocurrencies, financial institutions, and the public and private sectors may become blurred.

Appendix

Selected data from dbDIG survey of over 3,600 customers (further data available upon request).

Demographics of people who prefer plastic cards and digital wallets payment methods

	Cash						Dematerialized (Plastic Cards and Digital Wallets)					
	US	UK	Germany	France	Italy	China	US	UK	Germany	France	Italy	China
Base	33%	29%	59%	18%	33%	22%	66%	70%	40%	79%	67%	66%
Female	33%	27%	58%	19%	35%	16%	66%	73%	41%	76%	65%	67%
Male	32%	32%	60%	16%	31%	28%	66%	67%	39%	83%	69%	63%
18-34	37%	23%	53%	27%	40%	21%	62%	76%	45%	70%	58%	71%
35-54	30%	33%	52%	12%	33%	17%	69%	67%	48%	86%	67%	65%
55+	32%	33%	71%	15%	25%	51%	66%	67%	29%	81%	75%	42%
Rural/ Countryside	40%	32%	65%	14%	42%	36%	57%	68%	35%	81%	58%	61%
Suburban	28%	29%	56%	21%	37%	22%	70%	70%	42%	78%	63%	61%
Urban	36%	28%	59%	19%	29%	21%	63%	72%	41%	79%	70%	68%
Up to €20,000			72%	26%	49%				24%	69%	51%	
€20,000 to €29,999			61%	23%	29%				39%	73%	70%	
€30,000 to €39,999			63%	19%	30%				37%	77%	69%	
€40,000 to €49,999			67%	11%	21%				33%	89%	79%	
€50,000 to €69,999			47%	13%	26%				53%	83%	74%	
€70,000 to €99,999			47%	8%	18%				53%	90%	82%	
€100,000+			50%	11%	33%				50%	89%	67%	
Up to £20,000		37%						63%				
£20,000 to £29,999		31%						67%				
£30,000 to £49,999		29%						71%				
£50,000 to £69,999		20%						80%				
£70,000+		23%						77%				
Up to $15,000	54%						45%					
$15,000 to $24,999	38%						60%					
$25,000 to $34,999	37%						62%					
$35,000 to $49,999	36%						62%					
$50,000 to $99,999	28%						71%					
$100,000 to $149,999	18%						81%					
$150,000+	20%						77%					
Up to ¥119,999						31%						58%
¥120,000 to ¥179,999						19%						63%
¥180,000 to ¥239,999						17%						66%
¥240,000 to ¥299,999						24%						64%
¥300,000 to ¥449,999						16%						84%
¥450,000 to ¥599,999						16%						84%
¥600,000 to ¥999,999						6%						83%
¥1,000,000+						6%						89%

To what extent do you agree or disagree with the following statements about cryptocurrencies (e.g. bitcoin, litecoin)?

The below tables include the US, the UK, Germany, France, and Italy.

	They are easy to purchase				They are good for the overall				They are volatile			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	18%	13%	12%	14%	15%	8%	5%	10%	19%	25%	38%	27%
Somewhat agree	28%	25%	24%	26%	22%	16%	8%	16%	28%	30%	26%	28%
Neither agree nor disagree	31%	41%	40%	37%	40%	44%	38%	41%	36%	34%	27%	33%
Somewhat disagree	16%	15%	13%	15%	15%	17%	19%	17%	13%	7%	5%	8%
Strongly disagree	6%	6%	12%	8%	8%	14%	31%	17%	4%	4%	4%	4%
% Agree	46%	38%	35%	40%	37%	25%	13%	26%	47%	55%	64%	55%
% Disagree	23%	21%	25%	23%	23%	31%	49%	34%	17%	11%	10%	13%

	It is difficult to sell them				They are completely anonymous				They are unregulated			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	14%	14%	18%	15%	17%	15%	19%	17%	18%	24%	33%	24%
Somewhat agree	23%	25%	25%	24%	26%	28%	28%	27%	26%	28%	35%	30%
Neither agree nor disagree	37%	43%	44%	41%	36%	41%	37%	38%	35%	35%	24%	32%
Somewhat disagree	17%	12%	8%	13%	15%	12%	9%	12%	14%	9%	5%	9%
Strongly disagree	9%	6%	4%	6%	6%	5%	7%	6%	6%	5%	3%	5%
% Agree	37%	39%	43%	40%	43%	42%	46%	44%	44%	52%	68%	54%
% Disagree	26%	18%	13%	19%	21%	17%	17%	18%	20%	14%	8%	14%

	It is easy to commit fraud using them				They are difficult to understand				They are replacing cash			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	21%	22%	31%	24%	20%	21%	33%	25%	12%	9%	7%	9%
Somewhat agree	29%	30%	30%	30%	30%	32%	34%	32%	22%	19%	13%	18%
Neither agree nor disagree	33%	37%	29%	33%	27%	32%	22%	27%	29%	32%	24%	29%
Somewhat disagree	13%	8%	4%	9%	14%	10%	6%	10%	21%	20%	20%	20%
Strongly disagree	5%	4%	4%	4%	9%	5%	4%	6%	16%	21%	36%	24%
% Agree	50%	51%	62%	54%	50%	53%	67%	57%	34%	28%	20%	27%
% Disagree	18%	12%	9%	13%	23%	15%	10%	16%	37%	41%	56%	44%

	They are replacing debit/ credit cards				I will never invest in them				They are creating a financial bubble			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	12%	9%	5%	9%	21%	27%	50%	33%	13%	16%	25%	18%
Somewhat agree	22%	15%	10%	16%	23%	26%	20%	23%	28%	30%	33%	30%
Neither agree nor disagree	31%	30%	26%	29%	33%	31%	21%	29%	38%	41%	32%	37%
Somewhat disagree	20%	22%	22%	21%	15%	10%	5%	10%	13%	10%	6%	10%
Strongly disagree	15%	23%	37%	25%	8%	6%	3%	5%	7%	4%	4%	5%
% Agree	34%	25%	15%	25%	45%	53%	70%	56%	42%	46%	58%	48%
% Disagree	36%	45%	59%	46%	22%	15%	9%	15%	20%	13%	10%	15%

To what extent do you agree or disagree with the following statements about cryptocurrencies (e.g. bitcoin, litecoin)?

The below tables include China.

	They are easy to purchase				They are good for the overall				They are volatile			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	16%	14%	26%	16%	18%	15%	12%	16%	17%	15%	25%	17%
Somewhat agree	33%	36%	40%	35%	30%	27%	12%	27%	27%	27%	29%	27%
Neither agree nor disagree	28%	27%	13%	26%	29%	31%	25%	30%	34%	36%	31%	35%
Somewhat disagree	15%	18%	13%	16%	17%	20%	27%	20%	16%	15%	13%	16%
Strongly disagree	7%	5%	8%	6%	6%	7%	24%	8%	5%	7%	2%	6%
% Agree	49%	50%	66%	51%	48%	42%	24%	43%	44%	42%	54%	44%
% Disagree	22%	23%	21%	23%	23%	27%	51%	28%	21%	23%	15%	21%

	It is difficult to sell them				They are completely anonymous				They are unregulated			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	12%	16%	15%	14%	16%	15%	16%	16%	16%	14%	29%	16%
Somewhat agree	30%	22%	30%	26%	27%	23%	37%	26%	34%	29%	27%	31%
Neither agree nor disagree	25%	29%	36%	28%	38%	32%	29%	34%	30%	31%	17%	29%
Somewhat disagree	25%	25%	13%	24%	15%	25%	16%	20%	12%	21%	19%	17%
Strongly disagree	8%	9%	6%	8%	5%	5%	2%	5%	8%	5%	8%	7%
% Agree	42%	38%	45%	40%	42%	38%	53%	41%	50%	43%	56%	47%
% Disagree	33%	34%	19%	32%	20%	30%	18%	24%	20%	26%	27%	24%

	It is easy to commit fraud using them				They are difficult to understand				They are replacing cash			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	19%	14%	15%	16%	14%	14%	10%	13%	17%	14%	10%	15%
Somewhat agree	37%	28%	34%	32%	29%	25%	27%	27%	31%	25%	26%	28%
Neither agree nor disagree	23%	34%	30%	28%	27%	30%	39%	30%	29%	35%	12%	30%
Somewhat disagree	16%	16%	17%	16%	20%	20%	18%	20%	14%	18%	22%	17%
Strongly disagree	6%	9%	4%	7%	10%	11%	6%	10%	9%	7%	30%	10%
% Agree	55%	42%	49%	48%	42%	39%	37%	40%	48%	40%	36%	44%
% Disagree	22%	25%	21%	23%	31%	31%	24%	30%	23%	25%	52%	27%

	They are replacing debit/ credit cards				I will never invest in them				They are creating a financial bubble			
	18-34	35-54	55+	NET	18-34	35-54	55+	NET	18-34	35-54	55+	NET
Strongly agree	16%	13%	11%	14%	11%	14%	21%	13%	14%	16%	13%	15%
Somewhat agree	32%	29%	21%	30%	29%	22%	31%	26%	33%	32%	38%	33%
Neither agree nor disagree	29%	31%	25%	30%	31%	31%	23%	30%	34%	32%	32%	33%
Somewhat disagree	17%	20%	26%	19%	18%	22%	19%	20%	13%	15%	11%	14%
Strongly disagree	6%	7%	17%	7%	12%	10%	6%	10%	6%	6%	6%	6%
% Agree	48%	42%	32%	44%	40%	37%	52%	39%	47%	48%	51%	48%
% Disagree	23%	27%	43%	26%	30%	32%	25%	30%	18%	21%	17%	19%

Demography of citizens who have personally bought/sold crypocurrency in the last 12 months

	18-34	35-54	55+	Overall
China	29%	26%	8%	26%
Italy	14%	6%	1%	7%
France	14%	5%	1%	6%
Germany	12%	6%	4%	7%
US	11%	9%	0%	7%
UK	8%	4%	1%	4%

We would like to thank Anthony Chaimowitz for his contribution to this piece.