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IMPLICATIONS FOR CENTRAL BANKS

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P R O C E E D I N G S

MR. WESSEL: Good afternoon. I'm David Wessel. I'm director of the Hutchins Center on Fiscal and Monetary Policy here at Brookings, and it is my pleasure to welcome the people in this room and also the online audience to our event on digital currencies and what they mean for Central Banks.

It seems to me that bitcoin may or may not be a speculative bubble, a question we are not going to answer today. I personally don't think it's on the verge of replacing the dollar or the euro or the RMB, but there's no question that it's drawn an enormous amount of attention. Somebody said to me the reason that central bankers have their staffs working on questions of digital currencies and cryptocurrencies is because central bankers get asked about it every time they give a speech so they have to have some answer, so their staff has to do a lot of work. But beyond that, I think importantly, we know that the technology underlying cryptocurrencies, block chain, distributed ledger has the potential to reshape finance the way the information technology has shaped so many other industries. And as a veteran of the print newspaper industry, I think central bankers are wise not to assume that this technology is a passing fad. I've seen that in practice and it didn't work out very well for newspapers.

I think that we all know that fintech, digital currency, cryptocurrencies create enormous risks, risk to financial stability, possibility that people will use them for terrorism or money laundering or crime or scam. But we also have to open the possibility that they could create huge opportunities for a more efficient financial system and one that's more inclusive.

And I think the trick that central bankers are facing now, the balance

they have to strike is between enough oversight and regulation so we don't get the bad stuff, but not so much that we deny ourselves the good stuff.

So I am very pleased that my colleague, Eswar Prasad, who is a senior fellow here at Brookings and also a professor of trade at Cornell, had the idea of doing a report that sort of sums up what questions are facing central banks and what they're doing about it. The report, with a terrific appendix, is on our website and you're welcome to it.

And after Eswar makes a brief presentation, we're going to be joined by Rana Foroohar, who is a global business columnist and associate editor at the Financial Times, who will moderate a panel of people who come at this from very different perspectives.

Agustin Carstens now is the general manager of the Bank for International Settlements. Used to be the governor of the Bank of Mexico, so I asked if I could call him governor, and he said no. So I propose calling him just General Carstens. Not everybody may be familiar with the Bank for International Settlements, so here's the short description. Central bankers are paid to worry about what might go wrong in the world economy. The Bank for International Settlements is paid to worry about are central bankers worrying enough. So that's his job.

Urjit Patel is the governor of the Reserve Bank of India, an emerging market economy of huge scale, of course, but a country which is showing the ways in which digitalization can bring a whole lot of people from the informal economy into the mainstream.

Stefan Ingves is, of course, at the other end of the development spectrum, governor of the Sveriges Riksbank, and Sweden faces the fascinating

problem, one that keeps some central bankers up at night, is what happens if more and more people stop using currency. It's not happening in very many places, but it is happening in Sweden.

So Eswar will make a brief presentation. Then Rana will moderate the panel and we will have time at the end for questions. So thank you all very much.

(Applause)

MR. PRASAD: Well, thank you, David, for at least endorsing the appendix to my report, if not the report itself.

Sadly, this report, after you read it, will not teach you how to make money using bitcoin. In fact, there is a sad fable (inaudible) academic. About a year and a half ago, I was thinking of buying a few bitcoin because I was beginning to think about these issues and it seemed like a fun thing to do. An ally of mine at the time was in the audience and offered to help me with it because it's not a trivial process. But I shooed him off saying, you know, I had more important things to think about. So right now I have zero bitcoin but I do have a report.

What the report tries to do is really frame the issues that I think central bankers are contending with. And as one thinks about the purview of these issues, they really stretch across a very broad spectrum. So what I cover in the report is how different central banks are approaching this issue, what we should think about in terms of the different concepts of money that might be relevant in this analysis, then talk a little bit about how financial markets, institutions, and financial stability might be affected. And there are some direct, as well as indirect links to what central bankers need to be worried about, which of course is not just monetary policy but also financial stability. I'll then talk a little bit about the monetary policy

implications and then leave the international monetary system for the end.

Many central banks are being dragged to thinking hard about digital currencies, by which I mean not just nonofficial cryptocurrencies such as bitcoin, which of course has been gathering much of the headlines, but also digital versions of fiat currencies, and possibly even cryptocurrencies issued by central banks. Some central banks, like the one headed by Governor Ingves are being forced to think about this because of the dramatic changes in payment systems within their countries. If you look at the share of currency, defined as currency bank notes and coins as a share of a broad monetary aggregate, like M2 as a ratio to GDP or as a share of retail payment transactions. All of these are plummeting in Sweden.

So in Sweden, as in many other countries, the question then becomes, what happens as we start thinking about a scenario where payment systems become very decentralized? And one of the themes that floats the report as David mentioned, many of these developments are going to have significant positive benefits. But at the same time, central banks do need to be worried about whether this decentralization and the fact that the payment mechanisms are not going to be anchored by any official foundation could create problems in bad times. So in good times, you can see these systems working very well, but central bankers have to worry. They need to be prepared for bad times. So there is a crisis of confidence when these decentralized payment systems start coming into question or start breaking down for a variety of reasons. That could affect not just monetary stability but economic activity as a whole. So these are issues that central banks at some level are being forced to contend with.

And at the same time, of course, we see some central banks making a fast move. Interestingly, it's some relatively small central banks in Tunisia and

Senegal that have already moved ahead with issuing digital versions of their currencies, and then as you probably heard, there are some central banks, like Dosa Venezuela that have issued cryptocurrencies trying to ride the bitcoin wave.

Now, there is an interesting set of issues there about how fiat currency might be set up, whether one would use the distributed ledger technology, and if one was to use that, who would be the people who provide verification of transactions within the system? Unlike say in a bitcoin like set of it, in fact, the transaction -- most transactions are decentralized in terms of their verification. Certainly, it might make more sense for a central bank to manage the settlement process on its own and the verification on its own, but that, of course, brings up another set of tensions between anonymity, which cash current provides, and with the central bank issued digital currency certainly might not provide.

But one can see the potential for even a central bank's basic functions to be transformed. For instance, from managing a wholesale payments and settlement mechanism to a retail mechanism, this might seem like it is an enormously convoluted task and perhaps not even something a central bank would consider doing given the enormity of the technological challenges, but this is where the new technologies do make a difference. With distributed ledger technology, it becomes relatively straightforward. Maybe not quite yet but fairly soon for a central bank literally to have electronic wallets for every citizen, which could allow it to run monetary policy in a very different way, and effectively manage a retail payment system of its own.

Now, what are the implications for financial markets of these changes? Finance, of course, is going to be improved. Again, as David suggested, by the tremendous improvements we see in financial markets. Right now there are,

you know, costs galore and inefficiencies abound in terms of payment and settlement mechanisms, and the notion of certain transactions taking days to be settled, even domestically, let alone internationally. And for this verification process to be something that is not entirely trusted certainly suggests there is room for improvement.

But if you think about money, it's important to keep in mind that what we might think of as basic money, which is currency, bank notes, and coins, is not really the big component of money. If you take a broad monetary aggregate, like say M2, currency and bank notes and coins are a declining fraction of overall monetary aggregates and the banking system plays a really important role in the creation of what is thought of as money. So what happens to banks and traditional financial institutions then becomes hugely important.

If you break down the functions that traditional banks play, this includes, of course, the broad function of financial intermediation, but within that are certain advantages that banks have that they can bring to bear in dealing with certain issues, like maturity transformation, getting around information asymmetries. If you start breaking down these functions, it then becomes interesting thinking about what the technological changes might mean for each of these functions.

Let's take information asymmetrics. We've all heard about how in China Alipay is starting to use transaction histories in order to proxy for credit histories, and these, in fact, are known to be much more potent mechanisms for using a variety of transactions and economic activities rather than just a specific banking relationship in order to get good credit (inaudible) potential borrower. So one can very easily see that traditional advantages that commercial banks have eroding as we see other sorts of mechanisms of financial intermediations, such as

peer-to-peer lending.

An important question remains about whether this can be scaled up, but certainly, there is a great deal of competition for banking on the horizon. And as many of the inefficiencies in the financial system are eroded away, the traditional competitive rents or anti-competitive rents that banks could collect are going to erode. So what banks look like and whether they will still play a powerful role in the creation of money in this very broad sense is a critical issue. And this is where again things become a little analytically murky if one starts thinking about technological developments. Certainly, payment systems are going to become much more efficient. In China, in India, one can conduct very small micro transactions with street vendors and so on using payment systems that have been decentralized and that are intermediated, not through the traditional banks but through other platforms. And one can see this very easily catching on.

So as one thinks about multiple decentralized payment mechanisms, a plausible argument could be made that this is going to act as the stability of the system. But the risk here again is if one gets a fragmented set of payment systems, at a difficult time, one can very well see confidence being shredded in these systems and that can put in jeopardy a broad swath of economic activity. So what role the government or the central bank should maintain in terms of managing control of at least a part of the payment system infrastructure then becomes an important issue.

There are a variety of analytical issues I think that need to be dealt with as well. If one thinks about information flowing much more freely with the new technologies that is certainly a compelling argument for why financial markets should work a lot better. But as we know from work that many academics have

done, including Han Shun from the BIS, you can get other sorts of issues where you might end up with certain information aggregators becoming very powerful in an economy where there is a lot of information but not very good processing ability, and that can actually lead to situations where, in fact, you have informational cascades and herding and contingent behavior becomes worse, not because of limited information but because there is too much information but not enough signal extracting and processing capability.

So in terms of financial institutions and regulation, I think there are many challenges ahead. Then when one thinks about monetary policy, one comes up with a similar set of issues. Digital currencies are certainly going to make certain aspects of monetary policy implementation a lot easier. If we all had electronic wallets, Governor Patel or Governor Carstens in his former incarnation, could very easily enforce a negative deposit rate on us, which is a little difficult to do under present circumstances. So the traditional zero nominal lower bound, which we economists used to believe was a construct that was not just a theoretical one but was a hard constraint in terms of monetary policy, that may no longer be a constraint. The famous helicopter drops of money that Bernanke talked about, one could literally do the helicopter drops and not just through coordination with the fiscal authority but by directly putting money into each of our bank accounts.

So at some level, monetary policy is going to become easier, especially in difficult circumstances. But at the same time, if traditional commercial banks play a much less important role in finance, if the central banks' role in terms of settlement and facilitating payments across financial institutions starts eroding, that makes monetary policy implementation a lot more challenging.

It is possible certainly that with better financial markets, with better

information flows, monetary policy implementation could, in fact, become much more potent. But again, here there is a cautionary aspect that with the traditional finance institutions not relying on the banks, on the central bank as much, certain monetary policy instruments that are traditionally used by the central bank, the very short-term borrowing rates which the Fed now uses, could become much less potent if more financial activity gets outside the traditional financial institutions.

And then there are questions in emerging markets about the interest sensitivity of the nontraditional part of the financial system, which poses another set of questions about whether or not just in emerging market economies but also in advanced economies, the burgeoning of a different part of the financial system could, in fact, affect the potency of monetary policy one way or another. It is to be determined.

Let me then come to the issue of the international monetary system and what challenges or differences the evolving technologies might make. At one level, we are going to face, I think, much bigger challenges in terms of managing flows across national borders. Certainly, there is a lot of inefficiency in the payment system if it takes days for international financial transactions or remittances or more formal financial flows to be settled and for the money transfer associated with those transactions to go forward. But one can very well see that as we have more channels for international financial flows permeating, all the risks associated with those channels start proliferating as well. Issues such as dealing with anti-money laundering and combatting of financing of terrorism, which Mr. Carstens worries a lot about these days -- General Carstens, sorry -- worries a lot about these days. These become far more important for an emerging market central banker like Governor Patel. Now, there are complicated issues related to whether capital

controls or any attempt to manage capital flows become less potent because there are so many more channels for money to flow across national borders.

Just a few months ago, China, in fact, shut down bitcoin exchanges, but also bitcoin trading because of fears that bitcoin was providing an avenue for capital -- speculative capital outflows from China, which they were trying to control at the time.

Finally, when one thinks about an issue that David raised about whether these currencies -- the fiat currencies that we now love and live with, could be challenged in any significant way by cryptocurrencies, I think some remarks that Governor Carstens had made I think are really key. And these come down to the issue of trust. What I think we are likely to see because of the changes in financial technology and the changes in payment mechanisms are what I would think of as a bifurcation of the roles of money. Traditionally, money as we think about it has played three key roles -- as mediums of exchange, units of account, and indeed, a source of value. One can very well see these functions now being much more easily split apart because you don't need the traditional fiat currencies like the U.S. dollar in terms of international trade and finance transactions. Right now it's very easy to trade in dollar instruments because they are very liquid. The cost of transacting in dollar instruments is very low. But as payment systems become more sophisticated, more decentralized, as costs fall, there is no good reason why oil and other commodity contracts need to be denominated just in dollars. You can think about a multitude of currencies, real, virtual, national, transnational that could start playing a much bigger role.

But I think the question of trust and whether there is going to be a good alternative in terms of safety I think remains to be seen. So what I think we

are going to see is a very significant evolution in international finance with much more efficient payment systems, with much more de facto open capital accounts, and therefore, free of flow of capital across national borders, which is going to bring a lot of benefits. But I think a huge number of attendant risk as well. So what I think we are at the threshold of is a very important stage in the evolution of international finance, but perhaps not quite a revolution, at least not yet. Thank you.

(Applause)

MS. FOROOHAR: Wonderful. Eswar, that was terrific, and such a good encapsulation of the benefits, opportunities, and really potential challenges of digital currency.

So we going to now have hopefully a very vibrant and robust discussion with the panel here. And then we are going to leave plenty of time for you all to weigh in with questions as well.

So General Carstens, Mr. Carstens -- I'll stop that meme now. Let me come to you because you've got a birds-eye view of how many central banks are dealing with this new issue. And, you know, we set up, at least in the media we sometimes set up a paradigm of, you know, central banks, old line institutions. You know, they're the past. Bitcoin is the future. Block chain is in a whole different basket. But really, there is a history of central banks being innovative with digital currency. So give us a little bit of the high points there, and tell us the state of play in terms of how central banks are innovating with these currencies.

MR. CARSTENS: Well, thank you very much. First of all, thank you to Eswar and to David for inviting me here. It's great to have this panel.

One thing we have to think of to start with is that we think today about money. We have plenty of confidence in what we see, but most of us don't

know or don't necessarily need to know that to build the payment systems, to have the monetary arrangements we have today, it has been something that has been built through centuries. And we have gone from, you know, 400, 300 and so on years ago through many of these episodes where, you know, sort of the Holy Grail for many people is how to invent money. So in history there have been constant attempts to invent money. Because why? People want to become rich. People want to make a quick buck. Literally, you know?

So what have central banks done? I mean, central banks, we have one here, probably one of the oldest, the Riksbank, 350 years of age. They have established practices, rules, and so on through time so that money preserves its value and money is a good medium of exchange and a good unit of account. For me, Eswar, they are not separable.

Now, we have learned through many, many, many different episodes what needs to be done to have a well-functioning financial system and well-functioning money. Money, at the end of the day, is a convention. It is a social convention. We think that something is money because we know that somebody else will accept it and when it exchanges hands it will not lose its value. And when somebody puts a price in that unit of account, that price will be valued for at least quite some time. Through society, again, I even can say that civilization has been coming hand-in-hand with the innovation of money.

So the basic claim here is that suddenly we have a new form of technology, and can we expect that that new technology will substitute for all these centuries of creating good practices that in a way generates the trust that society has on the currency that we know today? Will precisely another currency substitute for all of that? And my answer is with absolute certainty, no. Technology doesn't

substitute all these learning processes that these behind the institution offer a central bank.

And as a matter of fact, if you take, for example, the most clear manifestation of cyber currencies, which is bitcoin, which is supposed to be, you know, the centralized -- it should work without intermediaries and so on, precisely the difficulty to deal with that is that they have created intermediaries because the peer-to-peer transaction is too difficult. And this is just one simple example.

So the bottom line is that technology, per se, cannot substitute for all what central banks do to make trustworthy currencies.

Now, this doesn't take away the possibility that in the future, as we have done in the past, central banks, we love technologies. As a matter of fact, I could even say that digital currencies were started in central banks many decades ago.

MS. FOROOHAR: So let's parse that a little bit. Governor Patel, Governor Ingves, I want to come to you and, you know, you have very different experiences in your own countries with digital currencies. How inevitable are they? I mean, are we basically moving either more rapidly or more slowly towards this future in your mind?

Why don't we start with you?

MR. INGVES: Let me start 350 years ago because --

MS. FOROOHAR: I'm going to push us up to 2018 at some point.

MR. INGVES: I almost alluded to that, but it's not going to take me hours to get to today.

MS. FOROOHAR: Okay. We've got time.

MR. INGVES: But this is important. And it's exactly what Agustin

was talking about because 350 years ago we had 40-pound copper coins. That was very inconvenient. So people started issuing notes. Paper-based notes. Then into 1800s, we ended up with about 30 banks issuing notes on their own, the Riksbank included. And the political wisdom of that day, which is exactly the same thing that has happened in a very large number of countries around that time actually, was a decision to make the central bank the sole, the only issuer of notes and coins.

And now fast forward to today, given that technologies have changed, physical notes are on their way out in my environment because technology has changed. Technology is changing and there is a rapid acceptance of new technologies. But that does not mean that all of the different features of money will change because money is essentially a convention. It's something that we have in our heads, something that we have agreed on among ourselves. And as long as we stick to those very, very basic agreements, the system works.

And what I think very often is underestimated when we talk about new types of technologies in the context of money or assets in some form is that when you think about new technologies, no new technology can produce money by itself. Actually, the real issue is that money is about a combination of a legal framework and a technical framework. And without the legal aspects of how you define money, you really don't have money. You have assets that people like to trade, like stamps or paintings and things like that. But when you get into the whole issue of payment systems and those issues, there are enormous returns to scale to run a payment system. And that's usually normally handled by the central bank in one way or the other.

And what is very much underestimated when we talk about the

technologies here and why people use central banks and like to use central bank payment systems is because if one bank pays to another bank, and whatever you call it is not passed through the payment system of the central bank, the only thing that happens is that one bank ends up with a claim on another bank. And bankers don't trust each other. So they don't like that. And that's why you have central banks transferring the money because that's the only safe way of transferring money.

MS. FOROOHAR: The LIBOR rate is ticking as we're speaking.

MR. INGVES: That's why we ended up with central banks in the first place over the centuries because all sorts of other systems have been tried.

But having said this, it, of course, means that if you stay in this business, want to stay in this business for the long run, then you'd better go with the flow because if you like to turn back time, then you're going to -- somebody else is going to take care of what you are doing, either central banks abroad or somebody is going to do it at least partially in the private sector.

MS. FOROOHAR: So I hear you making three points, and then Governor Patel, I want to come to you. I hear sort of three points here. One is that, look, technology is just a tool. This is just a new framework. What is important is the function and the trust that sits in the central bank, that you need a trusted intermediary between two counterparties that may have very weak levels of trust. And that central banks will get on board if they feel there is a technical and legal framework that is appropriate to the trust level of the institution. Is that a fair statement?

MR. INGVES: Yeah, that certainly is part of it because technically what you do does not really change if you have stuff on paper compared to running

everything through a computer. Physically, it takes a lot longer time to move paper around but the basic concepts are --

MS. FOROOHAR: Are pretty easy to --

MR. INGVES: They are the same.

MS. FOROOHAR: Yeah. Okay. So Governor Patel, when we were standing in the hallway waiting you made a very interesting comment which I think is true in many aspects of life, not just central banking. When it comes to implementation, we're all micro. So let's talk a little bit about the practical issues of moving to a central bank digital currency in your view.

MR. PATEL: So, you know, I would like to endorse what both Stefan and Agustin said, that what we are is a societal equilibrium in what constitutes money. And it has been an outcome of many failed experiments. Most didn't work. What we have is an outcome of that. And therefore, monopoly powers were granted to one institution eventually in each country. And it's underpinned by two things. One, the trust which was talked about and the central bank being at the heart of the payment system, it backstops. So even when one banker sends a dud message to another banker that something has to be settled, the central bank first does settle it and then asks questions to ensure that there are no loose ends. So I think that's important to underscore.

If you look at the three functions of money, from my standpoint, and you know, I'm a novice in this area that the crypto assets do not meet or only partially satisfy the key functions. The lack of intrinsic value, as well as the sharp fluctuations in their value imply that they cannot be used as a reliable store of value. As a means of payment or medium of exchange, they are far less effective, high transaction costs, reimbursement in the event of fraud, you know, is not available or

ensured. Very restricted acceptability by merchants. In the end, we all transact with merchants of one sort or another. And the high volatility observed in the top 10 cryptocurrencies, almost no prices are expressed in them, or very few. So I think that's important.

Also, unless we get some key regulations in place, some of these issues do not disappear. I mean, for example, just the practical aspect of cyberattacks, the amount of investment that central banks are now putting in both the financial and human and real resource, I can't see a third platform coming into this space and doing that, and I think that is going to be essential again to impart enough trust for people to use it.

From an emerging market perspective, and you know, this is one reason why we recently stopped any regulated entity that is regulated by the central bank to have nothing to do with crypto assets, and that's because of customer and (inaudible) protection. And this is especially low when misselling is rampant and financial literacy is relatively low. So that's one thing.

And you know, to underscore on the volatility, it is just so absurdly high that, you know, what you value and have in your pocket and that you would like to use for transactions becomes pretty much useless in the end.

MS. FOROOHAR: So those problems start to go away or at least be mitigated with scale though?

MR. PATEL: Well, you know, so on scalability, actually, some of the things that were promised have not happened. You know, bitcoin networks handle very few transactions per second, while for example, an interbank visa system handles, you know, a hundred times that. And one reason I think is because there is lopsided investment. And I think that again underscores that you need a

coordinator because you are getting parts of this whole system where a lot of money goes into the mining part and very little goes into everything else. And yet, it is a chain that needs to scale up in relative proportions together.

MS. FOROOHAR: Okay. I want to come back to the experience in India in a moment.

Eswar, let me kind of tease out something that was implicit in your presentation. One of the big lures of digital currency is the potential reduction of costs, the potential ease of transaction. Potentially, more inclusiveness. The ability of individuals to have greater access to financial services. I mean, you're already seeing some of that playing out in China. And yet, all of this sort of incredible globalism is happening at a time when in the nondigital world the opposite is happening. And this gets to the idea of legal frameworks and regulatory frameworks and how the digital economy in general is going to be regulated at a -- forget about a global level, just a regional level. We're still teasing that out. How do you bring all these things together as you're thinking from a central banker's point of view about how to move forward the digital currency?

MR. PRASAD: I have little doubt, to be honest, that these gentlemen's -- Agustin's institution and the bank of banks will be in business for hundreds of years to come. The question is what form they will have in the years to come. Certainly, there is a lot of hype about how much could be transformed. I don't think, as I mentioned at the end of my remarks, that we are at the threshold of a big revolution, but there are going to be some significant changes in the future. There are many positives I think to be taken from what is happening with digitalization of currencies. It will bring more activities out of the shadows into the formal part of the financial system. It will give people more access to the financial

system and that, I think, is a really important part. If you think not just about financial markets but about the economy as a whole, one of the reasons why, especially in emerging markets, but in many other countries, we are seeing certain (inaudible) political forces gaining power, it's because many people don't feel connected to the economy, and I think connection to the financial system is a very important part of it. If you feel that the reforms in a country are going to benefit the elite who are connected and most of the others are left out, this is, I think, a very important part of that connection. So I think that is at some level a really transformative power in the new technologies and as central banks adopt these technologies.

But I worry also about potentially downplaying certain aspects of what we are seeing in the world out there. I think trust is a really crucial issue. But one interesting question is whether verification can really take the place of trust. As Governor Ingves and Governor Patel correctly pointed out, it's very hard for banks, which don't trust each other, to have a mechanism that goes outside the central bank. But if you do have, as with the distributed ledger technology, a way of providing verification in a much more obvious way, one can think about central banks, maybe thieves working together essentially getting together and creating a verification system where they can cross-verify each other.

I don't think we're quite there yet. I don't know if there will be still an element of trust that is missing even among these financial institutions which are, after all, competitors. But I don't see it as implausible that verification could start at least to some extent taking the place of trust. I don't think it will take the place of trust enough to displace fiat currencies. I don't think it will displace something like the dollar that is a reserve currency. It is a store of value. And given the amount of

volatility we see in things like bitcoin right now, which paradoxically are being used as stores of value, apparently, rather than mediums of exchange. I can still see them beginning to play important roles as mediums as exchange as the technology matures and stabilizes.

MS. FOROOHAR: That's interesting.

Governor Patel, you're nodding. Do you agree with this?

MR. PATEL: I do broadly agree with what Eswar is saying. I think that there will be elements of this which either will come into play or already in play. I mean, the whole issue of financial inclusion, using the epayments, et cetera, that's already happening. So that is in a way more fintech rather than cryptocurrency or a crypto asset. And I would agree with Eswar on that completely that that is here to say. And in fact, I think on balance that is far more positive than negative.

MS. FOROOHAR: Well, and this is an important point, that when we, you know, we often in this conversation kind of throw everything in the pot -- bitcoin, block chain, distributed ledger technology, the idea of digital currency in general, these are very, very different things and the challenges are different.

I'm curious, governor, on the -- yeah, go ahead.

MR. CARSTENS: I have a -- sorry to interrupt.

MS. FOROOHAR: Yeah, please. No, jump in, please.

MR. CARSTENS: You said that you wanted --

MS. FOROOHAR: Interactive.

MR. CARSTENS: I question the issue of verification. For me, it's extremely inefficient, that if I want to do a payment to Urjit, everybody, not only in the room but in the world has to satisfy or has to agree that I'm entitled to make a payment to him. That's tremendously inefficient. It consumes huge amounts of

energy.

MS. FOROOHAR: Right. That's a key point.

MR. CARSTENS: The other important issue is that given the rules of certain algorithms that give place to these cryptocurrencies, it makes that accruing process, it generates congestion, and the verification can take forever.

To the point, and this is very important, you really never have complete certainty that the payment you have made today has finality. And finality means the payment is done, forget about it. If I had lunch here in the cafeteria, I paid my coffee, I had good coffee. I'm satisfied. They're satisfied. They know I've paid. If I had paid with bitcoin, I still, I would have cold coffee, and they still would be very fine if I wasn't trying to pay it with bitcoin.

MS. FOROOHAR: Okay.

MR. PATEL: So I think that there is a huge gap between where we are now to where we supposedly will be with verification. I think this is handled in a far more efficient way if we have dedicated institutions that have the relationship with the client. They have the ways to verify if the person has the resources. And crossing it through the central bank, assuring that there is finality, because if it happens the way Stefan explained it, we know that the payment has finality. And that is the key. What makes an electronic payment to me the same as a transfer of paper is that there is finality. And today, the cyber currencies do not guarantee finality.

MS. FOROOHAR: Governor Ingves, what do you think about that?

MR. INGVES: Yeah, no, the point here is that finality is a legal construct and you need a legal framework. It has nothing to do with technology. And from that perspective, everything I said in my earlier intervention had nothing to

do with crypto this or that or distributed ledger. That's a completely different issue, a completely different topic. I was only talking about what happens when you run a central bank and technologies change over time.

New technologies make it easier though for money to reach everybody, and that means that essentially what we're talking about is sending money from one cell phone to another real time. And that's a worthy vision for the future. It should be possible in my view if you run a central bank to make available a payment system such that you can make large value payments 24/7 and small value payments 24/7. If central banks choose to do that using their own currency, having defined finality, which is incredibly important, and in addition to this, what you also have to define is the concept of legal tender, which is sort of part of the whole issue of finality. If you do that, with a fairly high likelihood, I think that most central banks would produce a product, money, which is better actually than private sector produced money, or monies using the plural.

But having said that, of course, if you deliberately run your country or economy in such a way that you deliberately destroy the value of your own currency, then nowadays you can actually technically buy a payment system off-shelf because the technology is out there. I mean, that environment, of course, it's not surprising at all if we talk about the Zimbabwes and the Swahilis of the world, that the general public will choose to use a private sector produced currency in one form or the other because what you produce on the public sector side is so incredibly bad so your first choice is always to get rid of it and get rid of it as quickly as possible.

But then we get into a completely different topic, and that's why a worthy objective of a central bank is to, let's say, to stick to a two percent inflation

problem.

MS. FOROOHAR: But that wouldn't make as interesting of a panel. Come on.

MR. INGVES: No, no, no, but it is. It truly is because this is why you raised the issue of what is going on in Venezuela and what is going on in other countries. And given that nowadays you can buy this stuff off-shelf. Because the technology exists, it's not so hard to actually produce a system of your own. But if central bankers stick to what central banks are supposed to do, then it's much, much harder.

MS. FOROOHAR: Let's talk for a minute, and please, again, interrupt me, jump in with other thoughts, but I want to talk for a minute about the challenges of digital currency moving across borders. I mean, you know, just pulling way back, one of the challenges certainly of the last 10 years, arguably over the last 20 or even more is squaring the fact that globalization, neoliberalism favors capital over labor, over goods, does digital currency put that on steroids or does it potentially provide a solution? Do you have any thoughts, Eswar?

MR. PRASAD: We are going to see, well, again, this could cut both ways. If you have channels for capital to flow more easily across national borders, you could in principle have the right outcome with a more efficient allocation of capital around the world. But if you think that frictions, either informational frictions or frictions in terms of moving money across borders in terms of settlement, finality, that often so on are the true frictions. But if one thinks about it in a slightly different way about the fact that you could have different equilibria with informational cascades leading to money surging in or out, especially out of an emerging market country, one could see this in a different light as a new channel for spillovers of

policies in the advanced economies.

Now, I'm sort of mixing up the classical world with the new world because if all the advanced economies central banks adhere to, you know, meeting their inflation targets and you have a good set of macroeconomic policies in those countries, then you don't have those fears. But that's not quite what we've seen over the last decade. A couple of decades.

So in that environment where you have monetary policy spillovers, which are the consequence of imbalanced domestic macroeconomic policies, you create more channels for money to flow across borders, greater spillovers through financial channels, and less ability for emerging markets, central banks, in particular, to maneuver around those. So again.

MS. FOROOHAR: Governor Patel, do you think that digital currency would make the problem of capital flight a bigger issue?

MR. PATEL: I think not if the digital currency is remoted or introduced by the central bank, but the current lot does bring that risk I think front on. Also embedded with the KYC and AML concerns. And I think this is, given what has happened in the G20, et cetera, over the last eight to 10 years, I think this is a wall that this particular sector will come. All it needs is one or two cases to come out, and I don't think that it is now acceptable to have this.

The other point I wanted to make is that there is the issue of settlement also. Ultimately, all this is going to be settled in a bank account. And if it is going to be settled in a bank account, then nothing much changes from what we have today. And I think that all the standard setting, all the regulations will have to be put in place. And unless that is done, I don't see this thing growing beyond a point because the settlement by banks is a very important part of the closure that

both my colleagues talked about.

MS. FOROOHAR: Governor Ingves what do you think about the settlement issue?

MR. INGVES: It will always be there. It has always been there also in the old days. In the old days, when you did Hawala transactions, the issue was how to move gold. Now you can sort of move it -- no, no, no. This is important. Now you can move it electronically but the basics are the same. And the issue, which will be very important when you can introduce many new technologies in all of this is exactly the AML KYC issue, know your customer. And what happens if you don't know your customer? And to what extent will many countries accept that you can easily move assets in one electronic form or another around? At the end of the day, I don't think that that will happen because I do think that nation-states will cooperate in such a way that some of these transactions ending up on the dark side won't be allowed.

MS. FOROOHAR: Agustin, I'm curious if you, thinking about the central bank role as a regulator in many economies, are you concerned about the way in which the traditional banks are increasingly getting into the fintech game? You know, buying up fintech companies, tech companies coming in under the radar without regulation, the blending of these two words? Is that setting off risk bells for you at the moment?

MR. CARSTENS: Well, I mean, yes. I mean, there are some aspects that I'm concerned about. Probably the most important concern I have is if not only -- I mean, in some central banks, we have disposition. Some central banks have regulation. But if we talk about all the financial authorities, if we have the capacity to perform our job appropriately. You know, for example, you take, and

this is something that Eswar has been talking about or mentioned it in his introduction, to give an example now you have some banks that based on how well do you pay your credit card and some other publicly available information, they create an original process through algorithms. And that's very different from the credit origination process that traditionally it has been done by commercial banks.

Now, we have in many countries, probably more in American markets, we have an army of supervisors that are trained to evaluate the credit original process in the traditional way. But how many supervisors know how to evaluate, you know, the algorithm that now is doing the credit origination? So these talks into also supervision to be sort of included in the process itself. I mean, you will have to ingrain more some controls in the way banking will be done in the future. Supervision and regulation will have to travel at the same speed, and that means that governments and central banks will have to invest the resources to do that.

MS. FOROOHAR: At a time when the public sector is --

MR. CARSTENS: For me, that is the key aspect. We should embrace technology. We should try to make financial intermediation to be as efficient as possible, but certain things still need to be done to preserve financial stability, and we need that ability as authorities to run at the same speed.

MS. FOROOHAR: I'm curious what the rest of the panel thinks about the issue of algorithmic credit evaluation. I mean, are algorithms at the end of the day kind of only as good as, or as bad as the humans programming them? Do we need to think about a lot more resourcing or do we just need to think differently about this problem?

MR. INGVES: Well, I would say that we have always said this time is

different. And it's rarely --

MS. FOROOHAR: That's another panel.

MR. INGVES: And it's rarely the case. And that probably holds for all sorts of algo this and that as well. There are new challenges, but if somebody thinks that the sky is the limit because you used some type of new math, then eventually -- with a fairly high likelihood, things are going to go wrong. And then we'll have to deal with that.

MS. FOROOHAR: I want to, in just a couple of minutes, open it up to the audience and field a few questions. But first, I want to ask you all just to kind of ground some of this discussion, which is a little bit theoretical at this point. In the real world, I want you to do a little thought experiment, and I want to go down the row. And let's pretend that it's 10 years ago. We're going through the financial crisis and launching a program of QE with central bank issued digital currency. What are the issues you would be thinking about? Where are the potential challenges? How might monetary policy be changed by this? And maybe if you can just kind of highlight one or two things that come immediately to your mind as something that we should be thinking about?

Eswar, why don't you start?

MR. PRASAD: Actually, that is something I would love to hear a central bank governor's view on because I asserted in the report that, in fact, when it comes to monetary policy implementation, especially in very difficult times, digital currencies have certain advantages.

Now, one interesting twist to this is whether at a time like the financial crisis, again, one could argue about whether in a different world it would lead up to the financial crisis, but let's say we are in the crisis. The question is whether the

prevalence of alternative currencies creates an issue where the issuants at will of large amounts of these fiat currencies could lead to a debasement of fiat currencies. And that I think comes back to this issue of trust in a very, very important way when one thinks about the future, what the relative roles of the central bank issued fiat currencies or a legal tender might be against the cryptocurrencies.

I think one interesting thing that we are learning is that intrinsic value is very important in principle, but as we have learned, intrinsic value doesn't seem to matter very much. Even gold has a price way beyond its intrinsic value. Bitcoin doesn't have any intrinsic value. The fiat currencies have intrinsic value to the extent they are backed by the taxing authority of the government, but they all have values well beyond intrinsic value. You might think that something that can be produced in infinite supply cannot have the scarcity value that say bitcoin has. There are only going to be 21 million bitcoins that have been issued. But there is an interesting analytical proposition to be made, that in a very difficult time, it is that asset that can be supplied infinitely elastically that paradoxically has value. So what we learned in the financial crisis is that it was not necessarily the assets that were in scarcity but the one that could be provided at will that was, in fact, the one that held its value the most, the U.S. dollar, of course, but other major reserve currencies as well.

So this is where the world of monetary economics seems to be a little topsy-turvy. And I don't think that fundamental issue will change, even if we were to look 10 years out from now. I think the issue of trust that all the panelists have been talking about I think much more vehemently than I have, it's going to become really crucial.

MS. FOROOHAR: Okay. Governor Ingves, I want to hear. You

were nodding.

MR. INGVES: Well, I mean, at the peak of a crisis it's foggy out there and it's difficult to make the right choices. You don't fully know what's going on. But if you have a choice between different monies, again using the plural, you're going to use the money where you think that you're going to get your money back. And again, we're back to the whole issue of trust and who's producing it and how do you actually go about making this happen. And of course, at the peak of a crisis, exactly the awkwardness of all of this that you refer to is the fact that then if the central bank can produce an infinite amount of its own money, then people sort of realize that I'm going to get my money back. And that's how you make things settle down and take it from there.

MS. FOROOHAR: Governor Patel?

MR. PATEL: You know, this is not something that I have an answer to, but I think a bit too much has been made out that if you have digital currencies it's easier to make a helicopter drop. I think all you need is an electronic payment and a settlement system to have an electronic drop -- a helicopter drop. I think if central banks had wanted to do that it could have credited every citizen's account by X amount of money.

MS. FOROOHAR: Did you want to jump on that?

MR. INGVES: Just let me add, and I think we tend to forget when we talk about money, thinking about sort of physical cash notes and coins that already most of the central bank money produced is wholesale central bank money, and all of that wholesale money is already electronic. So when we're referring to cash, that's kind of a tiny, tiny fraction of what's going on in the system. And the only remaining issue when it comes to this is to what extent it should be possible for the

general public to hold an electronic claim on the central bank or not. Or whether we should instead have a system where only banks can have a claim on the central bank and all of this electronically.

MS. FOROOHAR: And this gets back. I mean, just to kind of square that circle, this gets back to the point I think you're making which is it's not really technology at stake here. It's institutional trust. It's who's backing this currency at the end of the day. And if there's trust, you can have a currency that works in whatever format.

Agustin, do you want to jump in on the thought experiment of trying to do QE with --

MR. CARSTENS: I share the view of Stefan. I mean, I think at the end of the day, the way QE was done, what it tried to do mostly is to take out of circulation a certain amount of assets that were not -- were difficult to be held by the market and that was affecting the yield curve. So one of the attempts to affect the yield curve, to have more of a bang for the buck was to do QE. But it was done electronically. So at the end of the day you have to think what are you trying to do through the policy you are instrumenting?

Now, if you ask me in the future, you know, yes, I mean, if there is different forms of financial intermediation, there is more technically driven financial intermediation and that changes the way people behave, that probably will affect the transmission mechanism of monetary policy. And we will have to learn how to deal with that.

But we already have gone through this. I mean, let me give you an example. When they introduced credit cards, you know, we had to learn how to deal with credit cards. And nothing happened. You know, we survived it. So I think

that we will do the same.

MS. FOROOHAR: I'll come back on that question.

But let me move on and take a few questions from the audience. And if you can please just make sure to introduce yourself, and also make sure there is a question mark at the end of your statement. No long statements or I'm going to pull the mic.

Okay, go ahead.

MR. ZAGONE: Hi, my name is Ryan Zagone from a company called Ripple. We use block chain and virtual currency as a way to connect fiat currency more efficiently. It's a product for financial institutions. And so it's an enterprise use case. We're using digital currency as an FX tool as opposed to a currency itself.

As new enterprise use cases for DLT and digital currency emerge, how do we balance policy to allow these new use cases to take root, while also capturing risk we see in the market today?

MS. FOROOHAR: That's a great question. Who wants to take a bite of that? Go ahead.

MR. CARSTENS: I mean, I think there are certain principles that need to be upheld when doing regulation. It's the same risk, same treatment. We have to really slice down what you're trying to do with technology and identify what is the underlying financial transaction you want to do. And if there is already a regulatory treatment, it has to be the same. Just because it's done differently through technology, that, at least from my own point of view, does not justify to give it preferential or aversion treatment. I mean, I think it has to be a level playing field and we, as regulators, we have to be, as we say, technology neutral.

MR. INGVES: It's sort of like saying, okay, if you look like a bank, if

you smell like a bank, if you walk like a bank, then you're a bank, regardless of what you think yourself. And that's exactly what Agustin says.

MS. FOROOHAR: Yeah. Of course, I mean, that gets into -- yeah, Governor Patel, go ahead.

MR. PATEL: I mean, I would just go a step forward and say that if some of these things enhance the interconnectedness with utility institutions, then in fact, regulatory grains of sand may actually have to be announced. But, you know, that would be done regardless of technology. But if technology does bring that about, then it is not something that the central bank or the regulator can turn its head away and say we want to get to that.

MS. FOROOHAR: Well, this is a very important point. I mean, you know, in this country anyway, you can look and smell like a bank and still not be regulated like one so, you know, I mean, look at a lot of private equity. There's any parts of the shadow banking sector. But maybe what you're saying is that these technologies will provide an additional catalyst for a regulatory framework shift that might already need to happen which is interesting.

MR. PRASAD: Could I pursue that for one second?

MS. FOROOHAR: Yeah, please.

MR. PRASAD: Because this is an interesting question because a ripple, in particular, as I understand it, and I'm not advocating for it necessarily, but they argue that they are working with financial institutions in the two countries that are already regulated. So what they are trying to make more efficient is a channel through which transactions between those two financial institutions are intermediated, settled, and so on. So do you see your institutions as having a role there? You spoke about grains of sand (inaudible) because you feel that the

financial institutions can somehow -- or that you would lose control of those financial institutions because of these new channels?

MR. PATEL: Or actually the connections between these two -- one of these two institutions and the rest of the utility part of the financial system. So if the financial institution that is using this bridge with another financial institution, if the spillovers from one of them to the rest of the financial system, in particular the banking system, if that somehow, the risks to that get enhanced, then the regulator has a duty to look into it. That's what I say.

MS. FOROOHAR: Comment up here.

MR. CECCHETTI: I'm Steve Cecchetti from the Brandeis International Business School.

This is a fascinating discussion. I want to bring it back to your question about 10 years ago but a little bit differently, and ask whether or not if central banks -- if we had all had digital wallets 10 years ago that had central bank digital currency in them, what would have happened to the private financial system at that point? And what would all of you do, for instance, with your bank deposits if it's September/October of 2008? And what happens to the central bank under those circumstances?

MS. FOROOHAR: Great question.

MR. PRASAD: I think what Steve is saying, who is an insider --

SPEAKER: He used to work at the BIS.

MS. FOROOHAR: Okay. That's all right. We planted him. It's all right. You can still answer the question.

MR. CARSTENS: No, I think what he is implying is that the digital -- central and digital currencies can facilitate wrongs against banks. And they can

attract resources to central banks (inaudible) commercial banks. And that opens a whole can of worms because then you might have some problems with some commercial banks. Then you have to determine what the central bank will do with the resources. The central banks are not created to intermediate financial resources. So in the central banking community, that's something that has been -- is being analyzed very, very carefully.

MR. FOROOHAR: Go ahead.

MR. INGVES: I mean, this is, of course, an issue that comes back again and again, and many have views on this, and quite strong views. But I do think that when you think about runs on banks, normally nowadays when you have a run on the bank it starts in the wholesale market. And the wholesale market is already completely electronic. Also today when you have a run on banks, you can easily move deposits from one bank to another bank and no one has said that that's not allowed. And also, it kind of implies promise on the side of most central banks is that we'll give you whatever cash you want. So what you kind of hint at is that either there are promises to be kept or not. And that's already sort of built into the system regardless of this narrow topic, digital money held by the general public. And then it, of course, depends on how you create that type of currency.

But we're not talking about that. What I think is really, really important, in addition to that narrowly defined question that you put to us is the rest of the system with central banks being lenders of last resort. Bail in, all these other things that you do within the financial sector in order to stabilize the situation. If nothing of this other stuff, deposit insurance were to be there so that the only thing that you have is sort of a central bank and a digital currency, then, of course, something what Agustin alludes to might happen, but that's not the real world

because we have all those other things as well.

MS. FOROOHAR: So just to clarify, what it seems like you're saying is moral hazard, too big to fill, none of that stuff really changes unless the underlying regulatory and political framework changes?

MR. INGVES: Not in my -- not the way I look at it.

MS. FOROOHAR: Okay.

Governor Patel, did you want to --

MR. PATEL: You know, you mentioned wallet providers. Our experience has been that the wallet providers, having some regulatory oversight by the central bank actually has helped for businesses to grow. And I think that's because of the implicit arguments on the backstops that have been talked about. Because, you know, the person using a wallet also uses a bank. I mean, it's not that he never uses a bank. And so the issue of interoperability also comes into play. And once any part of a transaction involves for any individual, a bank, then having some regulation on the wallet provider only helps to enhance the business. But that's our experience. It could be different elsewhere.

MS. FOROOHAR: Okay. I think there's a question towards the back in the middle there, and then we'll take a couple others.

SPEAKER: Thanks for a very fascinating discussion. (Inaudible) of the Maxwell School and also eCurrency.

I'm going to be provocative. Now that the battle has ruled out cryptocurrency or nonlegal tender are essentially counterfeit money, what -- does the panel feel there's a need for a central bank-issued digital or a fiat currency? And what form should it take? Should it take the form of an account-based system or a non-account value-based system? Love your thoughts.

MS. FOROOHAR: Do you want to just go down the line there and give your thoughts?

MR. INGVES: Well, there is not a good answer to that and that's because when I started out talking about our history it's going to take political decision to come -- to figure out what to do and what not to do. And in my country, back in the late 1800s, in Parliament they discussed for about 20 years before the Parliament that day gave the central bank the sole right to issue currency. Physical notes.

Now, when technology changes, that debate, and that's the issue you raise, is going to come back. And the answer to that question is not going to come from the central banks themselves. The central banks can look into this and explain these things to the politicians, but ultimately, at the end of the day it's going to require some kind of political judgment because this is about, at the end of the day, what kind of a society do we want when we talk about the construction of the financial sector and the agreements that we have among ourselves when we define money? So central banks can look deeply, deeply into this, but at the end of the day it's in the hands of the politicians to decide. And their decisions will, at least for a while until new technologies show up eventually in the future, what kind of a structure of the financial sector we have.

MS. FOROOHAR: Governor Patel?

MR. PATEL: So, you know, one benefit of a central bank-issued digital currency is that the costs do come down. And that is something that everyone wants, including the government.

One reason why -- while I agree that there is a political aspect, it's not only the reasons that Stefan mentioned but to my mind, what could emerge is a

sort of wallet where the electronic currency is issued by and destroyed by the central bank. And unlimited goals. You will have a full trail of every transaction that is made, much like how DMET form of equity and bond trading created a trail. And while you may not use it, it's there. But people have lost anonymity at various levels in this sphere, but this last one then goes that is provided by the physical currency, once you have a central bank provided electronic currency, the issue of anonymity and privacy may become important. On the other hand, because of AML and KYC results, society might take the view that you would actually like to know who is spending exactly what on how much and where, so.

MS. FOROOHAR: Go ahead.

MR. INGVES: We have had a few cases where the bad guys have sent money from one cell phone to another. If you want to be on the dark side, that's not a good way to do it.

MS. FOROOHAR: Agustin, do you want to --

MR. CARSTENS: What I would say is that this is no one size fits all. I mean, certainly central banks have to look into the real possibility of having to do this. When? I don't know. It depends on the country. You have to look into all the different aspects. I think you have to prepare your own country. You have to prepare your financial system. And there are issues that are quite, as Stefan says, they're political.

I mean, for example, today, I have in my wallet some U.S. dollar bills and I'm Mexican and the U.S. government doesn't mind that I have U.S. dollar bills. I don't know if the U.S. government will be happy about me having an account with the Fed. So, you know, there are issues that you have to think about. And so, I mean, again, I think that technology -- we central banks are not allergic to

technology. We will move with technology. We will use technology, but we need to be ready and we need to prepare the people we serve adequately.

MS. FOROOHAR: This actually touches on the point that, you know, Eswar, you raised, and I kind of asked you all about which is that in a globalized digital currency world, you still have politicians in national countries that have to make decisions. You get into data markets. Those are becoming increasingly contentious, how they're going to be regulated in the EU versus the U.S. versus China and the emerging markets. These are massive challenges. Yeah?

MR. PRASAD: Absolutely.

MS. FOROOHAR: Okay, yeah. Just checking in about that.

There was a question way in the back and then I'll come back up here.

MR. KLEIN: Aaron Klein, Brookings.

I was really thrilled to hear central bankers talking more about money as a system of credits and debits. I was disappointed that the old thinking -- I think it kind of goes all the way back to John Locke of a medium of exchange and an inherent store of value is still there because I think if you just think of it as a system of accounts and debits and credits, it encompasses the rest and gets you out of the fact that, you know, these things have no intrinsic value or we're not actually exchanging plastic. We're just exchanging credits and debits.

The question I wanted to ask involves the core issue of identity. I'm particularly interested in the experience in India, which seems light years ahead of here in a country where we have no federal identity, and state-level identity is of varying degrees to the point where some states' identities isn't even good enough to fly on. In the coming future, how core is solving identity to expanding digital

currency or solving some of the frictions in our existing system? And how do you foresee an identity world that's based on a national, or in the U.S.'s case, subnational system working or integrating in a global financial system?

MS. FOROOHAR: That's a great question. I would also like to hear more about the Indian experience.

MR. PATEL: You know, the national identity program in India was motivated by none of these considerations. However, these considerations could help to liberate its use.

MS. FOROOHAR: And just to clarify, this was a block chain-based system, yeah, for folks that don't know?

MR. PATEL: Well, I actually don't know whether it was a block chain or not. It's a centralized system.

MS. FOROOHAR: Yeah. I think it was digital ledger.

MR. PATEL: It is digital. It is biometric, and it is centralized and set up by a government-sponsored entity. So what specific technology or programming was used, I don't know.

But it very soon became important for the government's social expenditure program that the money goes to the right person and the right bank account. So concurrently, while the national identity system was rolled out, the government had a program called JDY, which was essentially opening up a basic account for all households in India. And that is now in the process of getting seeded by the national identity numbers and the biometric data. And in a way, these are the collateral benefits when you do put in place a cutting-edge system like this. And, you know, in the future there will be many more users.

Let me just be a little bit provocative with regard to what Agustin said

that, you know, how would the Fed feel that you have an account at the Fed. But in a way, if you open a bank account sitting either in Mexico or in India with Citibank in New York, in dollars, you do have an account at the Fed. I mean, so I don't think it's that big a step, actually. And --

MR. CARSTENS: Well, explain that to a politician.

MR. PATEL: Don't say it too loud.

MS. FOROOHAR: But can I just, before we move on to another question, can I just consolidate the Indian experience?

So you've got a country that has managed fairly successfully to develop a digital identity program. Has there been a discussion with other intergovernmental agencies about how that could be used around tax? Has there been conversation with the central bankers around (inaudible)? What's the sort of ultimate aim for how this kind of technology could be used?

MR. PATEL: You know, if one were to identify the most basic objective behind introducing this, it is actually to empower people because once there is a legal backing for a person's identity, including an address, a bank account, et cetera, for that person to get credit, to build up a credit history, et cetera, becomes easier. And in that way, the financial inclusion objective of the government was served. And many departments of the government are thinking of leveraging that technology, and I'm sure in the future there will also be nongovernmental initiatives in this respect.

So it was something introduced to solve a very basic problem and then things will be built up on that.

MS. FOROOHAR: So I think the gentleman here had a question.

SAMSON: Hi, my name is Samson. I'm representing the millennials

today.

And so my question is, until this gentleman back there said cryptocurrencies, you hadn't used the term, so I thought that was interesting because we're over an hour in this debate. So the first question is, were you guys banned from using that term, or prevented or discouraged? And the next question is, we bulked our jumbled digital currencies and cryptocurrencies in the same bucket. Why do you do that?

MS. FOROOHAR: Anybody want to take that on? I don't think we were banned from using the term, at least I wasn't, using the term "crypto," but it didn't come up.

Agustin, do you want to --

MR. CARSTENS: No, we are perfectly happy to use the word "crypto." There is no -- we don't have an allergy against that word.

I didn't get the second question. What was it?

SAMSON: When you say digital currencies and you include cryptocurrencies in that, what's the difference between digital currencies and cryptocurrencies?

MR. PATEL: So maybe I should take that. So cryptocurrency, the way -- I have some definitions in the report. You don't even have to go to the appendix for that. It's in the main section.

So digital is basically a formulation of a currency that's non-analog, and the cryptocurrency is a technological manifestation of the digital currency. So you can have a digital currency issued by a central bank that doesn't use this crypto-based technologies. You can have a more straightforward technology. Cryptocurrencies, in fact, can either be private and nonofficial, or official. As I said,

there are governments around the world, like Venezuela has already issued a cryptocurrency. Not very successfully. (Inaudible) plans to issue one. Estonia, Macedonia plan to issue. So, no, we're not banned from using the terms, but I think they're using the digital currency terms specifically in regard to what the implications might be for monetary policy and for central banking more broadly.

MS. FOROOHAR: Okay. Question here. Let's take three at once and then I think that that'll be our last round.

MR. KRY: Hi, Christian Kry. So you kept the discussion sort of separate in terms of currency. I'm just wondering if the other things that people rely on government, let's say health service, is there a connection between how these systems evolve for, you know, financial currency and basically health? In particular, you know, if governments have been ahead of the game, maybe all the profit has gone to speculation, bitcoin could somehow have been invested back into health services.

MS. FOROOHAR: Okay. Next question? And the third, down here.

MS. KRAUS: Hello, my name is Sarah Kraus. I work on the Financial Integrity Team at the World Bank.

There are many different reasons why countries might decide or decide not to introduce central bank issued digital currencies. As you said, it's a political decision, not a decision by the central bank. So it could be that the country has a defective banking system or that there are issues with payments or that the country believes it will increase financial inclusion or the central bank really wants all the transactions data in one centralized place, or it could just be reputational reasons that they want to be seen internationally as a leader in technology. I'm wondering when push comes to shove, what do you think sort of will emerge as the

decisive reasons why countries decide to go one way or another? And if and when that happens, will we see that happen first in emerging and developing economies or in developed economies?

MS. FOROOHAR: Okay, very good.

And last question, back here.

MR. SEVAGO: Thank you. Diego Sevago from the Cato Institute.

My question is about financial stability. And not whether cryptocurrencies are bad for financial stability but whether the technology might be good in the sense that the unique selling point is that there is no single point of failure, and a big issue in the last crisis was this lack of certainty as to whether some transactions could actually proceed and whether there was not just liquidity but solvency in some of these central counterparties. And indeed, they've become a systemic point in regulation after the crisis. I just wonder, to the extent that securities trading and derivatives trading can move to decentralized technologies, are central banks perhaps a bit encouraged by this? And are they conducting simulations as to what the regulatory implications might be? Thank you.

MS. FOROOHAR: Okay, great.

Let me first just rephrase. Decentralization, safer? Not safer? Let's do a speed round with that. I know this is taking you out of your comfort zone.

MR. PRASAD: Mixed. It's going to be safer in some ways because you have multiple decentralized systems, but potentially, unsafe during a time a crisis or confidence because none of these may have government backing. If you don't have a good alternative government backed payment system you could have chaos.

MS. FOROOHAR: Okay.

MR. CARSTENS: If I have to say something, given the nature of technology, today decentralization doesn't operate at the (inaudible) of being centralized and we'll already have seen some exchanges or wallets that have gone bankrupt.

MS. FOROOHAR: Governor Patel?

MR. PATEL: I don't think that some aspects of subsectors of the financial sector that you mentioned can work in a decentralized manner beyond a point. So I think it's a moot point.

MR. INGVES: Yeah, with enormous decentralization, I think we lose eventually the definition of money at the national level. Everything after that is going to revert back to the payment system run by the central bank.

MS. FOROOHAR: Okay. And Eswar, since we're in your house here, I'm going to give you the last word. Or ask you the last question because we're out of time.

Do we think we're going to see the use of digital currencies in mass within emerging markets or in developed economies first? And if so, what will this be driven by, either way?

MR. PRASAD: I think in emerging markets there is more of a need given the fact that there is less financial inclusion, given that these technologies are catching on.

But I'd like to end with a sort of broad point actually about the where central banks are going. I think that central banks are actually going to become a lot more important in the coming years, but it could go one of two ways.

MS. FOROOHAR: Wow, I didn't think they could be more important.

MR. PRASAD: They are going to get more important. But one of

two ways. I think one way is where, in fact, they become much more pervasive. Even in the payment system, one can think of these electronic wallets. Essentially, with the lower cost of transactions with the developing technologies, giving central banks the ability to manage not just wholesale payment systems, but even retail payment systems so they become even more important. But one can also think of an alternative scenario where, in fact, you do have some degree of decentralization, where you do have fragmentation of financial markets, but with more efficiency and more activities shift away from the traditional banking system which not only means lesser lines in the central banks but also the fact that in terms of direct settlement and payments, the central banks may have a less important role. But I think even in that scenario, the fragilities in the private part of the fragmented financial system will mean that the central bank will play a critical role when things start turning bad.

So whether the central banks maintain a very important role in normal times, so whether they become very important, but only in bad times when there is a loss of trust, where there is a loss of confidence, and you need the central banks, it's an interesting point. But I'm glad you central bankers are on the job.

MS. FOROOHAR: Okay. The only digital game in town. Thank you.

(Applause)

MR. WESSEL: Thank you all for coming. I have a nondigital request. We have yet to be completely digital at Brookings, either in our agendas or in our coffee cups, and there's another event here this afternoon. So my colleagues' and maintenance would greatly appreciate it if you'd take the papers and coffee cups at your seat and put them in the deposit in the back. And someday when we get to digital currencies we'll have digital coffee cups.

Please join me in thanking Rana and the panel for an excellent

discussion.

(Applause)

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