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## Digital Value Transfer Systems

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# Digital Value Transfer Systems

Edward Castronova\*

## *Abstract*

*A “digital value transfer system” (DVT) is a computer program that moves purchasing power from one person to another by exchanging different forms of virtual currency. In this Essay, I will give examples of DVTs and explain how they work. Then I will use the economic theory of budgets to explain how DVTs increase the liquidity and reach of all forms of virtual money. In effect, DVTs make all forms of currency, from dollars to frequent-flyer miles, essentially equivalent in terms of purchasing power. I conclude with a brief discussion of the possible implications of DVTs for the economy and for government policy.*

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*I. Digital Value Transfer Systems**A. Definition*

A “digital value transfer system” (DVT) is a computer program that moves purchasing power from one person to another by exchanging different forms of virtual currency. They represent an innovation in money. Most traditional value transfer systems work within a single currency. So, for example, when I write a check to the car dealer for my new BMW 700-Series automobile, I am creating an order that tells my bank to give a certain number of dollars to the car dealer. The dealer takes this order to his bank. His bank takes it to my bank and asks for those dollars. My bank hands them over, and his bank puts the dollars in his account. The part where the two banks interact is where purchasing power—economic value—moves from me to the car dealer. It happens with one currency: the dollar.

If someone wanted to operate with a different currency, he would have to go to a currency exchange. He would take the currency he holds—dollars, for instance—and ask the exchange bank for the equivalent in another currency—let us say yen. An exchange rate would be used to trade one form of money for another. No value changed hands here, except for the service fee charged by the exchange bank. In theory, the purchasing power of the two forms of currency ought to be the same. The same person held equivalent value before and after the transaction, but he held it in a different form of money. Historically, these value transfer systems operated face-to-face. The various orders and checks and bills were written down on paper and physically carried around. Today, of course, it is all done with computers.

DVTs change this situation by combining the value-transfer element and the exchange-of-currency element. With a DVT, a person can hold any amount of value in any number of different currencies. When a person buys something, he orders the DVT to transfer purchasing power from him to the seller, using one, some, or all of the currencies available. Everything happens digitally and instantly. Which currencies are used could depend on many factors: the buyer may only have certain currencies available, the seller may only accept certain currencies; the buyer

or seller may have indicated a preference for some currencies over others; the DVT may have been programmed to favor some currencies and not others (depending on value stability or breadth of reach); or some currencies may have gone defunct and lost all their value.

Much of this is invisible to the buyer and seller. The seller states a price in terms of one currency. The buyer indicates a desire to buy. The DVT figures out a package of value equivalent to the stated price and transfers it to the seller. It may require nothing more than a single tap on the buyer's smartphone to send the value to the seller. The buyer does not need to know that he bought the BMW using a combination of dollars, yen, US Airways frequent-flyer miles, VISA Reward Points, and Indiana University Basketball Seating Priority Points. Neither does the seller. The DVT makes sure that the combined portfolio of monies adds up, at current exchange rates, to the stated price of the car.

In this Essay, I will not get into the finer points of managing a portfolio of monies. Presumably a DVT can also be ordered to pay attention to the stability and reach of the monies held and, as suggested above, express priority for stable, secure, broadly accepted forms of money. Programs for managing a person's many digital currencies will be as important as the DVTs that move them between people. But here I focus only on the latter.<sup>1</sup>

### *B. Examples*

The first monetary institution that made me think of DVTs was the Facebook Credit (FBC) or, more accurately, the system left behind when the FBC system was closed down.<sup>2</sup> FBCs were supposed to be a currency that operated across the entire Facebook system. Using dollars, people could buy FBCs from Facebook and then use the FBCs in apps to buy virtual goods.

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1. This is a good place to point out that "person" in this Essay includes corporate persons.

2. See *Facebook Scraps Its Own Credit Currency for Apps*, BBC NEWS, <http://www.bbc.com/news/technology-18519921> (last updated June 20, 2012, 8:07 AM) (last visited Aug. 15, 2014) (describing the FBC system and why it was eventually shut down) (on file with the Washington and Lee Law Review).

The app owners could then sell the FBCs that they had gained back to the Facebook system, cashing out in dollars—after paying a 30% fee.<sup>3</sup>

Facebook soon declared an end to the FBC system, offering instead to allow any app developer to create his own currency on the same terms. That is, the app could tell Facebook to sell its currency to users at a certain rate in terms of dollars, and then, after collecting them back again through the app, cash them out with Facebook after deducting a 30% fee. The Facebook monetary system became a DVT: a system that transfers purchasing power among different currencies, different virtual goods, and different people. In the Facebook system, it does not matter what the name of the currencies are. They were all named “Facebook Credits” for some time, but then the owners of Facebook realized that the name is irrelevant. Why indeed would each app have to have the same currency name? Moreover, it did not matter what the denomination of the currencies was: if one app sells 1,000 gold crowns for a dollar, and another sells 10 ruby gems for a dollar, the Facebook DVT recognizes that 1 ruby gem is worth 100 gold crowns and adjusts all trades accordingly.

The Facebook monetary system obviously only works in Facebook, but other DVTs outside of Facebook have emerged. These systems go by the name “wallet.”<sup>4</sup> A wallet is an app that manages all of your loyalty awards programs. You enter the information from all your programs, and the app keeps track of what you can buy. If you are trying to buy a blouse from Target, for example, you can wave your phone at the cash register, and the wallet app will find out what kind of money you have to pay for the blouse. You might be able to get it with Target loyalty points, with a Target gift card, with reward points from a credit

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3. See Miguel Helft, *Facebook Hopes Credits Make Dollars*, N.Y. TIMES (Sept. 22, 2010), [http://www.nytimes.com/2010/09/23/technology/23facebook.html?\\_r=1&](http://www.nytimes.com/2010/09/23/technology/23facebook.html?_r=1&) (last visited Aug. 15, 2014) (“Through Credits, Facebook will take a 30 percent cut.”) (on file with the Washington and Lee Law Review).

4. See Greg Bensinger, *Amazon Is Next Up to Try a Digital Wallet App*, WALL ST. J. (July 22, 2014, 2:42 PM), <http://blogs.wsj.com/digits/2014/07/22/amazon-is-next-up-to-try-a-digital-wallet-app/> (last visited Aug. 15, 2014) (describing the “Amazon Wallet” app) (on file with the Washington and Lee Law Review).

card, with rebate points from the blouse's manufacturer, or with dollars from your bank account. The wallet stands ready to transfer value from you to Target, using any number of different currencies.

## *II. DVTs and Budget Theory*

### *A. Budgets with Different Forms of Money*

DVTs are a significant innovation in money because they eliminate the boundaries between "official" money, like dollars, and "virtual" money, like rewards points. To see how, consider some lessons from budget theory in economics.

Suppose we have a city that has a budget with two categories: education and roads. The city's total budget is \$100 million. The city council wants to put most of the money into roads—\$70 million, in fact. That leaves \$30 million for education. Parents are outraged. In response, the council passes a law stating that taxpayers can " earmark" their taxes, dedicating them to specific uses. A taxpayer who wants all of his money to go to education can check the "education" box on his tax form. His tax dollars will then carry an education earmark; they are not mere dollars, they are now "education dollars." They can only be spent as part of the education budget.

Tax day rolls around, and while most people have not checked any boxes—most people do not really care—many of the parents, but not all, have earmarked their taxes for education. In the end, \$20 million of the tax revenue is earmarked for education and \$20 million is earmarked for roads. Sixty-million dollars come from general funds that are not earmarked.

What does the city council do? Previously, it had put \$30 million of its funds into education and \$70 million into roads. Now, it must adhere to the earmarking. Thus, it puts \$20 million of earmarked funds in education and \$20 million of earmarked funds in roads. It has \$60 million to freely distribute. The council's preferences have not changed, of course; they still want a thirty-seventy split, between education and roads. So, they put \$10 million of the general money into education and \$50 million

into roads. At the end of the day, education gets \$30 million and roads gets \$70 million—just as before.

Earmarking generally makes no difference.<sup>5</sup> Labeling purchasing power with different words generally does not affect the decisions people make. Put differently, people treat all forms of money the same way. These forms of money are just different ways of making a transaction.

### *B. The Practical Operation of DVTs*

In practical terms, this means that DVTs eliminate the difference between official and virtual money. People using a DVT to make a purchase will pay no attention to the form that their purchasing power takes. As DVTs evolve, they will gradually erase all lines between currencies. Let us go back to the blouse at Target. The blouse can be bought with dollars, Target Points, or VISA Points. In the DVT, there is a known exchange rate between all of these. Every wallet in the system knows how valuable Target Points and VISA Points are in terms of dollars, and this reveals how valuable the two points are in terms of each other.<sup>6</sup> The DVT will know, therefore, which currency allows the blouse to be bought at the cheapest price—that is, at the lowest net loss of economic value from the user’s wallet.

Suppose that the cheapest price currency for this transaction is VISA points. If the user’s wallet has enough of these, the wallet buys the blouse using them. Suppose however that the user (User A) does not have enough VISA points. In this case, the DVT can find another user (User B) who does have enough VISA points

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5. Earmarking only has an effect if the amount of earmarked funds exceeds the policymaker’s preferred total budget for the earmarked category. This is rare. Reverse earmarking—designating that money may not be spent for some purpose—is even less likely to have an effect. To be effective, the total of reverse earmarked funds must exceed all the money spent on other things. If a community charity clearinghouse has \$100 million and gives an objectionable organization \$2 million, the objectionable organization’s budget would only be reduced if more than \$98 million of the charity’s contributions were earmarked “anything but” that organization.

6. It is already common for people to trade rewards points for dollars. The DVT will internalize this trade and create markets of all currencies for all other currencies.

and then conduct an exchange transaction: User A sends User B a number of dollars—or Target Points—to pay for User B’s VISA points. Then User B’s VISA points are used to buy the blouse, which User A takes home. The DVT now updates the exchange rate between dollars and VISA points to reflect that the points are a little more valuable than they were before.

A DVT operating in this manner combines all types of currency into a single source of purchasing power. The exchanges among currencies, and between currencies and goods and services, are largely invisible to the users. If a DVT were to operate anonymously and “peer-to-peer,” these transactions would be difficult to interrupt. Software protocols for this sort of thing already exist. Examples include the Tor network,<sup>7</sup> BitTorrent,<sup>8</sup> and Bitcoin.<sup>9</sup>

### III. Implications

#### A. Proliferation of Currency

An anonymized peer-to-peer DVT would turn all forms of virtual currency into forms of money. Because virtual currencies are now quite easy to create and distribute, anyone can do it. This means that anyone can add to the total money stock of the

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7. See *Russia Offers \$110,000 to Crack Tor Anonymous Network*, BBC NEWS, <http://www.bbc.com/news/technology-28526021> (last updated July 28, 2014, 8:15 AM) (last visited Aug. 15, 2014) (“Tor hides internet users’ locations and identities by sending data on random paths through machines on its network, adding encryption at each stage.”) (on file with the Washington and Lee Law Review).

8. See Jon Healey, *BitTorrent Unveils NSA-Proof Online Calling and Messaging Software*, L.A. TIMES (July 30, 2014), <http://www.latimes.com/business/technology/la-fi-tn-bittorrent-nsa-proof-online-calling-and-messaging-20140730-story.html> (last visited Aug. 15, 2014, 1:24 PM) (“BitTorrent Inc., the San Francisco company behind the most popular technology for sharing files online, is branching out into a new arena: snoop-proof calling and texting.”) (on file with the Washington and Lee Law Review).

9. See John Wasik, *Who’s Got Your Back on Bitcoin Deals?*, FORBES (Aug. 13, 2014, 9:27 AM), <http://www.forbes.com/sites/johnwasik/2014/08/13/whos-got-your-back-on-bitcoin-deals/> (last visited Aug. 15, 2014) (describing Bitcoin and the possible regulatory issues involving its use) (on file with the Washington and Lee Law Review).



economy. Of course, this only refers to the nominal money stock; the real money stock depends on the valuation of the currencies that are floating around. Today, managing the valuation of currencies is largely the job of central banks. In the future, many people will be managing the value of many currencies, for better or worse. It will be more difficult for central banks to know, much less manage, the amount of purchasing power held by people in the economy.

### *B. Regulation and Taxation*

An anonymized and peer-to-peer DVT will also make it harder for governments to regulate and tax economic transactions. There is a real risk that a substantial fraction of the economy will “go dark” in the sense that trade will disappear into anonymous exchanges using fleeting forms of purchasing power.

If that “substantial fraction” is even quite small, the effects might be significant. Currently, the United States government spends approximately 50% of its budget on Social Security, Medicare, Medicaid, and similar programs and 25% on defense and debt interest.<sup>10</sup> That leaves 25% for everything else the government does: education, transportation, energy, science, law, and diplomacy.<sup>11</sup> If innovations in trade technology make even a small amount of the economy go off-book, there will be a reduction in tax revenue available to the government. If DVTs cause “only” 5% of the economy to go dark, that would mean a tax revenue loss greater than the entire United States government budget on transportation and education combined. Our governments are already being asked to do more than they can with current means. DVTs seem likely to make it harder to raise funds. The gap between what we want governments to do, and what they actually can do, seems likely to grow larger.

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10. CONG. BUDGET OFFICE, THE FEDERAL BUDGET IN 2013: AN INFOGRAPHIC (2014), [http://www.cbo.gov/sites/default/files/cbofiles/images/pubs-images/45xxx/Budget1\\_Overall\\_Final\\_0.png](http://www.cbo.gov/sites/default/files/cbofiles/images/pubs-images/45xxx/Budget1_Overall_Final_0.png).

11. *Id.*