Multidimensional Currency

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Let me begin with a quick reminder for those who are bad at math. They say that space has three dimensions: left-right, forwards-backwards, up-down. With these dimensions, every point in space can be precisely located: three steps to the right, two steps forwards, one step up, etc. Now if I want, I can add up these steps—i.e., three steps plus two steps equals six; but this would be completely meaningless, just as it would be meaningless to speak of adding up cabbages or carrots. My direction in space is identified not by one number (for instance, "6") but by a series of numbers (3, 2, 1). This series is known as a "vector." A vector refers to all possible points in what we call "multidimensional space." If am at the center of this space, every point within it can be defined precisely by three numbers, known as coordinates. By saying "(36000; -400; -12)," I clearly identify a single point in my space. A map is a two-dimensional space. On a city map, for instance, I can identify the North-South and East-West coordinates of my destination, and then find the way to get there. This kind of multidimensional representation is useful in daily life not only when I have somewhere to go, but also whenever I need to combine things that are not commensurable—in other words, things that cannot be reduced to a single dimension. And there are a lot of dimensions.

Take, for instance, a plate of spaghetti bolognaise: its dimensions are countless. There is the physical composition of the plate; the pasta, meat, and tomatoes; particular quantities of salt, water (to boil the pasta), and cooking time; the chemical composition (lipids, proteins, etc.); and even opinions concerning its taste, ranked on a scale from "delicious" to "terrible." All of these dimensions can be found in the production and consumption of spaghetti bolognaise. We integrate them into our daily actions, without worrying too much about it or finding it unreasonably complicated. Recipe books reduce these many dimensions to a handful: easy-difficult, quick-long, cheap-pricey, or filling-light.

The point of these details is to demonstrate that what I call "multidimensional currency" is not some new, incredibly complicated idea, but, on the contrary, a return to the oeconomy of the real—a shift away from arid monetary considerations to concrete questions like getting around a city or making a plate of spaghetti.

Let us consider how a family consumes a series of goods and services. Once I have carefully traced the entire process through which these goods and services are produced, using counting units that do not immediately distort reality by reducing everything to a monetary equivalent, it becomes apparent that goods and services have multiple dimensions: an amount of energy used, a quantity of heat and gas that was reused, another quantity that was released into the atmosphere, and so on. What quantity and what quality of labor was employed, and how much value was added over the entire value chain? What is the relative share of local as opposed to imported labor? Is the product new, used, or reconditioned? Was there a way to provide the same service with less material? What kinds of capital were employed? And so on. All of this data, all of these incommensurable dimensions can be grasped only if one has a suitable counting unit and a solid understanding both of the value chain and of the relevant territory's metabolism. Any exchange implies double-entry accounting—i.e., one party's asset is another's liability—in relation a large number of different actors, just as my liabilities in my family budget are the assets of many providers.

If I consider a list of the ingredients of the good or service that I happen to consume, I notice that they belong to different categories of goods and services (as defined above): immaterial capital is a first-category good; water and energy, a second-category good; and labor, a third-category good. My package of spaghetti is for the most part made up of third-category goods: it is divided when shared and can be produced in limitless quantities thanks to human ingeniousness, which determines agricultural productivity, the quality of machines, and the efficiency of human labor and of the distribution system. However, this package of spaghetti will also have incorporated, through its production process, different categories of goods and services, each corresponding to a specific system of governance. Are you still following? If not, take several steps backwards and start over again.

A final remark: incorporated labor may come from different communities, whose cohesion I contribute to preserving through continuous systems of exchange. These include the "world community," prefigured by the globalization of trade; the "European community" (my spaghetti is "Made in Italy"); and the community of store buyers, maintained by membership cards functioning as a kind of quasi-currency. I might also include the community of people who enjoy spaghetti bolognaise, with whom I might organize group purchases of spaghetti. Finally and most importantly, there are "territorial communities," which are established and preserved by local exchanges of labor, information, skills, experience, energy, etc. Just as on Facebook I can belong both to a community of Harry Potter fans and to one for *pétanque* players, each community can, as I have explained, manage these exchanges through its own special currency. This currency is nothing more than the recording in a single registry of all the transactions occurring in its midst, as the SWIFT system has done for bank transactions since 1973. This is the basis of all complementary currencies that have developed on all continents, many of which already use cards with memory chips.[1] Special communities also have concrete economic implications. For example, Bernard Lietaer describes the fascinating Japanese experiment known as "*Fureai Kippu*"[2]—literally, a "cordial relationship ticket"—that was launched in 1995 by the Sawayaka Welfare Foundation. According to this system, the time I devote to a senior citizen is recorded in a savings account that allows me to "acquire" the same care from neighbors of my elderly mother, who lives on the other side of Japan, if they belong to the same community of care exchange. Isn't this wonderful?

But how can the variety of dimensions that exchange implies being transformed into a method of payment? The latter must be a compromise between the need to "take everything into account" and the fact that I may need to buy a packet of spaghetti because it is almost dinner time and my bolognaise sauce needs two hours to simmer. For this, two things are required: a simple method of payment and a restricted number of dimensions. Consider the idea of an electronic billfold. A memory-chip card record many

[1] An interesting review of these currencies can be found in *Currency Systems for Global Sustainable Developement,* August 2007, http://money.socioeco.org.fr.The reader will find on this site many in-depth analyses of complementary currencies.
[2] Bernard Lietaer, *Mutations mondiales, crises et innovations monétaires.*

other dimensions besides just euros. The accounting notions of liabilities and assets can also be used to track many different dimensions. This, for instance, is what my membership card does when it subtracts my expense while crediting me with loyalty points. As for restricting the number of dimensions, it leads us to focus on four in particular: labor in one's local community, which for simplicity's sake I will call "local labor"; external labor; energy; and other material resources.

So I find myself with an electronic billfold and a four-dimension space—I find myself, in short, with multidimensional currency. Each of these dimensions corresponds, if you will, to a particular type of currency with its own logic. Each must respond to the three inherent anxieties associated with monetary exchange: the risk of counterfeits (i.e., that I be paid in monkey money); the risk of rapid declines in value; and the risk that vendors will refuse to accept it. For example, if my card has credits in complementary currency, denominated in hours of labor, or in a complementary currency issued on at the local level, vendors must still accept that all or part of the labor incorporated into the goods they sell me be paid in this currency. As soon as a "local actor" is created, with a territorial oeconomic agency managing the system of local exchange, a compensation fund can be created to establish fixed equivalencies over a given period—for example, one year—between a complementary currency and (say) euros, allowing local providers to reconvert my payment in local labor into euros, or me to refill my billfold in local labor credits through a payment in euros.[3] The function of the first dimension is thus to intensify exchanges, particularly on the territorial scale, to promoting a community's potential and talents, and to reinforce oeconomy's legitimacy by applying the principle of the least constraint.

As became clear in our example of spaghetti bolognaise, we must remind ourselves of how ordinary it is to use several different currencies. In 1998, Jérôme Blanc of the Walras Center found "for the period between 1988 and 1996, 465 recorded examples of the use of several parallel currencies in 136 world states … It is reasonable to think," he wrote, "that today, in all countries, parallel instruments exist alongside national currencies."[4]

[3] This "equivalence" with official currency is found in most experiences of complementary money.
[4] Jérôme Blanc, "Les monnaies parallèles : évaluation du phénomène et enjeux théoriques." Centre Auguste et Léon Walras, April 21, 1998.

When one speaks of a parallel currency, one often thinks of small-scale and activist-initiated experiences like LETS (local exchange trading systems); however, the use of currencies other than national ones is much more common, notably during periods of hyperinflation. This occurred, for instance, at one stage of the "dollarization" of Latin America. "Restaurant checks" or transport company's "miles" functions as counting units and payment methods, which are monetary functions, even if they only allow for the purchase of a particular type of goods and services. In addition to *Fureai Kippu* (see above), which requires thousands of members, the Swiss WIR Bank has also been a very instructive experience. Created in 1934, it is the ancestor of contemporary complementary currencies. It is an internal exchange currency used by Swiss companies, first created to deal with the currency shortages following the 1929 crash. Today the WIR Bank has 60,000 members and generates annual exchanges of nearly 2 billion Swiss francs.[5] Where the WIR Bank and *Fureai Kippu* are similar is that, unlike the "melting currency" of Gesell, the primary aims of which is to speed up exchange flows, they manage exchange over time: with *Fureai Kippu*,[6] one can keep one's "credit" until the day one requires one's own care; and the WIR Bank allows members to make each other loans.

To mention local currency as the first dimension of this multidimensional currency is thus not, in itself, revolutionary. What is revolutionary, if it even makes sense to use this term, is to make complementary currencies into an instrument of common law and to give them more importance—to make of it a currency as important and familiar in the long run as the euro or the dollar. We have entered an age in which the service sector constitutes the largest portion of the economy. Many of these services are delivered locally. The trend towards the "dematerialization" of the economy (which we have already discussed) reinforces this tendency, as it aims to substitute, whenever possible, services for goods. The diffusion of information technology and the Internet, which has contributed to fusing currency and finance, can also contribute to organizing local exchanges. As for the aging of the population, which has, along with the rise of individualism, created "savings silos" (i.e., pension funds), it can just as easily lead in the opposite direction, becoming, as in Japan, a powerful force in the development of

[5] See the article "WIR Bank" on Wikipedia.
[6] See the "Fureai Kippu" article on Wikipedia.

territorialized systems of assistance to the elderly. The financial crisis of retirement systems will undoubtedly lead to a search for alternatives. Many elderly people are becoming aware that the counterpart to the independence they achieved through comfortable retirement benefits is the isolation they face once they are no longer mobile. Finally, the continued aging of the population, and particularly the rising number of the "oldest of the old," will lead territorially-based "young" retirees to care for their "own" seniors, making it urgent that one abandon the tendency to rely exclusively on the employed population for financing care for the elderly.

As we see, the same technical and demographic factors producing abstract "financialization" and (monetary) transactions can thus also foster territorialization and (social) relationships.

Only the veil of ignorance that currently cloaks territorial metabolisms still hides from us the importance of these stakes. The first dimension of currency will contribute precisely to tearing down this veil over time. The attitude of local authorities themselves will prove decisive. Indeed, a very important share of local public expenditures is devoted to public services. One can thus imagine a virtuous circle in which authorities would accept that a share of local taxes would be paid in a local currency, and an equivalent share of public services would also be paid for in a local currency. The effect of generalizing this practice would be immediate. Remember that, not too long ago, debit cards were not particularly widespread—until, that is, the day when gas stations begin to accept them. The contagion was immediate.

I now turn to the second dimension of currency: the payment of labor performed outside a territory. This second dimension must necessarily be managed through an internationally recognized currency. The central question here is the predictability of this currency's value. Economic activity that takes into account the long term depends on the overall predictability of the evolution of various currencies. Is it possible today to return to the spirit of Bretton Woods, either by reconsidering Keynes' idea of new world currency, or by returning to fixed exchange rates between major currencies? This was debated in June 2008 at a seminar organized by the IRE and EPS (see above). It was not possible to arrive at a consensus concerning the means, political feasibility, or advisability of bringing greater stability back to the exchange system.

In my view, the necessity of doing so is nonetheless clear. First, uncertainty profits financiers at the expense of companies producing goods and services that are useful to society. The latter gain nothing when their profits depend primarily on their ability to manage uncertainties tied to financial investments, rather than on their ability to produce useful goods. In my professional life, I have observed that when the future of a company depends on financial juggling or the art of corruption, the entire company rots at its core. All the codes of conduct in the world can do nothing to change this. In this situation, "hidden qualifications" reward cleverness and underhandedness at the expense of competence. Additionally, instability benefits the best informed and the most mobile. This place poor countries and small actors at a disadvantage.

What are the solutions? In the seminar mentioned above, there was one point on which all agreed: the impossibility of returning to the former situation, in which the dollar was the de facto international currency and in which the expansion of the monetary mass denominated in dollars made Americans "consumers of the last resort" and the guarantors of global growth. The relative size of the United States in the world economy —barely a quarter of the global GDP—is now too small for it to still be able to set the tone. The relative decline of American power has up until now been compensated by its financial credibility; this moral credit, however, will probably be damaged for some time by the subprime crisis. Finally, private and public debt in the United States and surpluses held in dollars by Asian countries are now too great for their growth to continue without being a constant systemic threat. Even so, the United States remains a leader, and there is little chance for a global initiative seeking to renegotiate the global financial system to succeed unless it takes the lead. This will be one of the historic challenges faced by the American administration that succeeds Bush, and a possible aspect of the "New New Deal" to which I earlier alluded. In any case, the status quo is unacceptable; it must change. But in what direction? Three paths—which are more complementary than mutually exclusive—must be explored.

The first is to return to a better way of regulating capital flows—currency and finance now being inseparable, as we have seen. Deregulation is no longer fashionable. In the Asian crisis at the end of the nineties, the countries that maintained control over their

capital flows—China and India—survived the best. The need for greater public regulation is also a main lesson of the subprime crisis.

The second path is to head towards a federated global monetary system, founded on cooperation between major world regions. Each world region would have a standard currency that would be tied to others through a regional monetary "snake," like that of the old European Monetary System, which preceded the euro; between regional currencies, there would be fixed exchange rates, which would be regularly through a Bretton Woods-like system. This would be a way, if not to return to the fixed rates of Bretton Woods, to at least limit fluctuations between currencies.

But who today is in a position to summon a new Bretton Woods? It could be the G20, which is getting more and more attention. Beginning with the G8 session of the summer of 2008, it became evident that this self-appointed directorate, which at the outset was only a "G7," was useless unless China and India were present. Another possibility is that the International Monetary Fund (IMF) summon a conference attended by the world's regions, particularly the United States, the European Union, China, and India. The IMF was born at Bretton Woods and must, in any event, redefine its purpose. It could launch a joint initiative with the World Trade Organization (WTO), since the fact that both trade and currency now operate on a global scale makes them inseparable. It is also possible to consider a multiparty initiative including OPEC as well as major pension and sovereign funds.[7]

A third, more difficult task, also merits consideration. It involves creating from scratch a "physical" world currency (or global reference currency), consisting of a bundle of commodities (oil, wheat, copper, etc.), which would, in a sense, be a substitute for the old gold standard. Bernard Lietaer, the strongest supporter of this idea, calls this reference currency "Terra." I refer the reader to his books, particularly *The Future of Money,* for the full argument.[8] I don't agree with everything Lietaer says. However, since he wrote the book, I now see three new arguments that justify his thesis. The first is that oil is now fully integrated into the financial and monetary system. I do not mean to say that "Terra" actually already exists, but simply that there is no longer anything preventing

[7] Note from December 2008: The G20 hypothesis initially prevailed, but there is a risk (mentioned above) that it will consider itself not merely to have a summoning power, but as the authority that would actually create a new financial system. In my view, it cannot be the latter.

[8] Bernard Lietaer, *The Future of Money*, Century, 2001.

all international commercial exchanges from being denominated in Tonnes of Oil Equivalent (TOE).

The second argument is more important: if we want to make speculation on raw materials such as oil, wheat, copper, etc., less attractive, and prevent fluctuations in production volumes (be they the result of political circumstances, as with oil, or climactic ones, in the case of wheat) from triggering sudden price variations due to the stagnation of demand, we must regulate world markets through "buffer stocks". These stocks are destined to become a global public good. In the summer of 2008, the opening of the American Strategic Petroleum Reserve (SPR) helped bring down the price of oil after it rose dramatically in the spring. According to Paul Davidson, this had already happened in 1991 (with the oil shock caused by the first Iraq war) and in 2005 after Hurricane Katrina[9]). One cannot at the same time complain about American leadership and ask the US government to bear the burden of maintaining stocks on their own, as in the case of agricultural products after the Second World War,. The "food crisis" of 2008 showed that the world reserve stocks had, over the years, melted like snow in the sun. More than half of world's reserve stocks are maintained in China, and is used by the Chinese government for its own domestic needs.

There is perhaps here a historic opportunity, though. States, pension funds, sovereign wealth funds, and companies could join together to finance and manage stabilizing stocks. This would lead companies to use these reserves as their reference currency for trade, and pension funds to use them as asset reserve.

Finally—this is the third argument—very large corporations play a decisive role in organizing most of world trade, and they are few enough to agree amongst themselves on a new reserve currency. This brings us back to why value chains are so important. ISO standards are already an interface between the public and private sectors? They already provide incentives for cooperation and consensus building between companies, with the state's blessing. And isn't currency, after all, just an accounting standard like any other—the expression, as Lietaer puts it, of an agreement? A bundle of raw materials founded on international stocks would be, at the end of the day, a more credible exchange standard than the dollar, whose value is a function of American political imperatives.

[9] Paul Davidson, "Crude Oil Prices 'Market Fundamentals' or Speculation."

In sum, the first dimension of money is tied to territories and the second dimension to global value chains. Clearly, these two have a hard time leaving one another.

One could object that the price of oil is much too volatile to serve as a reserve currency. After all, it went from $10 a barrel in 1999 to $145 a barrel in July 2008.[10] But this volatility is a direct result of weak regulatory stocks. Oil production is fairly easy to regulate and predict. Demand for it evolves slowly. Even oil-producing countries have an interest in its stability.[11]

This brings me to the third dimension of currency: fossil energy. We all know we need to limit oil consumption, for two reasons: to contain within acceptable limits the irreversible process of global warming; and to prevent competition for the control of energy resources from degenerating into global conflicts. (Every contemporary conflict or potential conflict smells of oil and gas…)

Fossil energies are second-category goods. Their governance must satisfy imperatives of justice and efficiency. Individuals, nations and world regions have each a minimum right to existing fossil energy resources (this does not, however, mean the right to free energy). Since each individual's "share of global fossil energy reserves must decrease over the years, a quota of fossil energy for each individual and each economic activity will be required. Quotas will apply not only to energy purchased to fill the tank of one's car or the furnace needed to cook and to clean at home—they must also include energy incorporated into the good and services one purchases, which belong to one's ecological backpack. For each new purchase, the quota allocated at the beginning of the year would be charged to one's electronic billfold, just as one is charged in miles each time one applies some of them to buying a flight.

However, as the British politician David Miliband has suggested, anyone can sell part of or her quota to the highest bidder, instead of using it for her own needs,. A system of territorial auctioning, comparable to the stock exchange, would set for a given period the price of a Tone of Oil Equivalent transferred. Any transfer is immediately registered

[10] Daniel Cohen, "Pétrole, l'heure du doute," *Le Monde*, August 28, 2008.
[11] Note from December 2008: The fall of the price of oil to $40 in late 2008 only confirmed this volatility. Fall in demand was eventually tempered, but it was enough to dive the price of oil by four.

as a debit and credit on the respective cards of the vendor and the buyer. This mechanism is hardly revolutionary: in Europe, it is used in emission rights markets. Individual or companies can also increase their quota by producing and selling renewable energy. Finally, they can negotiate the price of energy transferred to a third party, for instance in the form of heat. Since the emission of heat is localized, its transfer is only negotiated one step at a time, which contributes to its being used more efficiently. On the basis of quotas allocated to everyone, fossil energy is sold to individuals and companies at a price fixed for a given period—for example six months—and revised in accordance with the changes of stabilized global prices, as in the case of gas.

It should become clear at this stage how the various dimensions of money are related to one another: if fossil energy is included in a global reserve currency, according to the hypothesis previously advanced, its price will automatically be stabilized, and the question of its price in the context of individual quotes will become irrelevant. Consequently, since fossil energy prices are not excessive, the poorest families will be able to survive and to put themselves in a position to sell their surplus. This requires technical support strategies and the creation of financial products of long-term investment, notably products allowing for the improvement of the housing stock's thermal efficiency. Remuneration for these financial products will follow the classic method of dividing up the savings thus achieved.

This territorial system of auctioning is only the first stage. Compensation mechanisms must be established between territories: territories that have not used all their quotas should be able to transfer them, using the same mechanisms, to territories that require them. Since direct and indirect energy expenses are, through the ecological backpack of consumed goods and services, for the most part tied to income, the third dimension of currency has two advantages: it is a powerful incentive to rapidly increase the efficiency of energy use, to take advantage of exergy, and to produce renewable energy; and it is also redistributes.

Let me finally mention, in conclusion, the fourth dimension of currency: that of consumed material resources (other than fossil energy). These material resources belong to different categories of goods but are similar to third-category goods in that they are recyclable. Since modern production processes can be traced in detail, goods and services

that are sold must provide precise information on the material processes consumed throughout the entire process. Indeed, the transferring onto a CRT (consumed resources tax) as large a share as possible of the financial burden that is currently placed on labor through the VAT (value added tax) is, as I have shown above, crucial. Naturally, the CRT will be returned to recyclers. Except for this fiscal portion, the "material value" of the purchased good is embedded in the market price. When the materials in question can be either purchased from abroad or extracted at home, it is reasonable to expect that the external part would be paid for in an international currency, and the internal part in a local currency.

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