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ΕΛΛΗΝΙΚΟ ΙΔΡΥΜΑ ΕΥΡΩΠΑΪΚΗΣ & ΕΞΩΤΕΡΙΚΗΣ ΠΟΛΙΤΙΚΗΣ
HELLENIC FOUNDATION FOR EUROPEAN & FOREIGN POLICY

Opinion Article

No 17
May 2014

Self-organized digital numismatic economies

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Greece has suffered a prolonged period of economic crisis and contraction unlikely to end any time soon, although signs of recovery are on the horizon. Scientists and political leaders alike, not only in Greece but also internationally, are in a desperate search for methods to revitalize the Greek economy. The structural problems facing the Greek economy are perhaps not unique to this country, and the attention of the global community is unlikely to be driven by mere curiosity.

The financial crisis in Greece and elsewhere is a case-in-point that our financial institutions are becoming obsolete in facing the pressing challenge of economic growth and individual well-being in modern societies. In this article, I call for a rethinking of financial institutions starting first from principles for the benefit of growth and prosperity. Urgent attention should be paid to such desiderata in austerity-driven economies, such as that of Greece or other economies of Europe, especially in its southern periphery. That said, the scope of my proposal is global.

It is imperative in my view that scientists and engineers design and implement (what may be termed *modern*) financial mechanisms starting from a clean slate which, nevertheless, are compatible with our contemporary financial structure and leverage the capabilities of the Internet. Both money -the most elementary financial instrument- and the Internet were very successful innovations that "escaped the lab" and became ubiquitous in society. What makes them so successful though? In answering this question, I stipulate that both money and the Internet derive their success from their ability to *facilitate coordination*.

In many situations, when individuals join forces, each of them can accomplish more at the individual level compared to what he or she would have accomplished had he or she acted independently. For example, a group of hunters can accomplish more for each member than what each hunter alone can accomplish. Or a group of drivers commuting to work can get to their destination faster if they all obeyed the traffic code. We will refer to such situations as *coordination opportunities* whose pursuit is generally hard.

Consider a group of humans who would all like to partake of food, receive medical treatment, and be entertained. Suppose that each has two options: To either satisfy these needs independently of the others (so that he or she becomes a farmer, a doctor and an artist at the same time) or to specialize in one of these activities and coordinate with the others, so that farmers provide food, doctors offer medical treatment and artists entertainment. Once a system to leverage this opportunity of coordination exists, depending on how economic activity is organized within the society, the possibility exists that its members will have an incentive to *free ride* on the efforts of others. The existence a medium of exchange of the products and services offered in the society (such as money) limits the extent to which free riding is possible.

Consider now a farmer, a doctor and an artist in a modern economy and suppose that they have lost their capital. In modern economies, goods and services are provided in exchange for money; however, assuming that our players have lost their capital, they have also lost access to this coordination mechanism. Therefore, they must coordinate differently.

One possibility for our players is to borrow money from a bank. However, in dismal periods, banks may be reluctant or unable to make loans. Furthermore, banks typically impose onerous conditions and interest rates that our players may be unwilling to accept. Another possibility is to establish a gift or barter economy, although market economies are more flexible. The players have a third possibility, which is to *institute an independent currency*. Instituting paper-based currencies is a costly enterprise; however, using the capabilities of the Internet, digital currencies can be established at a relatively lower cost (although such a cost is certainly not diminished to zero). Such an approach has the advantage of providing the flexibility of a market economy without requiring the procurement of capital, except perhaps for the institution of the digital currency.

Let us refer to such a financial mechanism as a *digital numismatic economy*. Economies of this sort can exist in parallel to the standard economy coordinated by a region's central currency, and they are especially attractive in countries with high unemployment rates and strict fiscal policies, which are nevertheless rich in human and social capital; Greece is a typical example of such a country where gift and barter economies thrive (cf. the barter economy in Volos). Furthermore, Greece has witnessed the emergence of more sophisticated media of exchange than a plain barter economy akin to money.

Organizing economic activity around digital numismatic economies has many potential benefits. Gift economies are vulnerable to free riding (as discussed earlier) and, therefore, providing the possibility of a common medium of exchange promises to increase the productivity of their participants as well as the economy's total output. That said, further research must be carried out with regard to institutional structures that permit the formation of gift economies without a common medium of exchange, since the introduction of such a medium should perhaps interfere only minimally with such institutional structures and ideally contribute to leveraging the best of both worlds. In barter economies, the common medium of exchange introduces flexibility. As a first step, digital numismatic economies can be introduced to replace more primitive media of exchange that have evolved in barter economies. As numismatic economies expand, they may even establish exchange rates with existing currencies and develop into diversified economies.

There are many challenges ahead in the design and implementation of digital numismatic economies, from both the economic and business perspective as well as the technical and engineering one. With respect to the former, mechanisms must be investigated for funding digital currencies by community members who can, in principle, only pull scarce resources to that end. There exist various possibilities on this front; for example, if the currency is managed by a centralized entity, then that entity can be funded through a (presumably small) percentage of economic activity. It is an interesting research question, though, whether such a centralized authority can be altogether avoided as to some extent is achieved in some digital currencies such as Bitcoin.

Furthermore, on the technical level, computer scientists and engineers should investigate the properties of digital currencies with respect to their robustness against players who can leverage significant computational resources against the (cryptographic as well as non-cryptographic) principles that govern their operation, but also with respect to the privacy of economic activity. Finally, methods should be explored for taxing the economic activity organized around digital numismatic economies, to the benefit of communities that leverage their potential as well as of nation-states that facilitate their operation. As we strive to foster societies' creative potential for innovation, *numismatic pluralism* holds promise to liberate our economy from the stagnation austerity-driven economic policies inexorably generate.

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