

Discussion of “On the Origin of Money”<sup>1</sup>

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July 8, 2016 (Conference, Banque de France, June 27, 2016)

The paper addresses a fascinating issue that has been the subject of a large literature whose existence I can only mention here. More than hundred years ago, Carl Menger used almost the same title.<sup>2</sup> My task is just to comment on the present paper. It has two parts: the first presents a theoretical model; the second discusses some historical evidence.

The theoretical part is divided in two sub-parts and makes an essential distinction between what is called a *credit economy* and a *money economy*. In the credit economy, infinitely lived agents are matched in each period in pairs, and can be either the producer of a unit of a good (at some cost, negative utility), or the consumer of that good (with positive utility). The mechanism for credit is not apparent in this setup, which seems more like a model of shirking in joint production. The assignments consumer-producers are random and independent between periods. Hence, it is difficult to see how agents can accumulate credit from past works about which there is no record. I will return to this issue below. If a person does not produce (shirk), she is permanently thrown out of the economy (with utility zero, which is the reservation level for not participating) by a government, with probability  $\rho$ .

The person who gets the job of production is induced to pay the cost because of the expected surplus of matches in the future, net of the tax that is extracted by the government before the match in the period. It seems that in this setup, the division of a period between morning and afternoon is not required. In this economy, the net surplus (which can be extracted by a government) is

$$G_1 = (1 - \phi) \frac{u - c}{2} - \frac{1 - \beta}{\beta} \frac{c}{\rho}, \quad (1)$$

where  $\beta$  is the discount factor,  $u$  the utility of consumption,  $c$  the cost of production (in utility),  $\phi$  a monitoring cost by the government.

The first term is the gross surplus a match; the second term is an enforcement effect that depends on the value of continuing in this economy. If the discount rate is vanishingly small, an individual who has been ordered to produce will always do so as long as the government

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<sup>1</sup> paper

<sup>2</sup> Menger, C. (1892). “On the Origins of Money,” *Economic Journal*, **2**, 238-255.

does not tax more, in each period, than the expected net surplus (net of  $\phi$ ) of the match in that period. When the discount rate increase, the continuation value decreases and the government can extract less of the surplus of a match.

In the monetary economy, agents are matched as before and they have either one unit of money or no money. As in a model à la Lagos-Wright,<sup>3</sup> the one who has no money works (cost  $c$ ) to produce a good that is sold to the other (utility  $u$ ) for one unit of money. The surplus in this case becomes

$$G_2 = m(1 - m)(u - c) - \frac{1 - \beta}{\beta}mc. \quad (2)$$

where  $m$  is the fraction of agents who hold one unit of money. The first term is the surplus of a match. A match is productive (generating a surplus  $u - c$ ), only if it pairs one agent with money and one agent with no money. The second has an incentive to produce to get the money from the first agent.

The second term is the enforcement effect. As in the credit economy, it vanishes when the discount rate tends to zero. Why does  $m$  enter the enforcement term? Because agents are restricted, by assumption, not to hold more than one unit of money. If you hold money and you meet someone with money, you cannot trade. The value of money decreases with the probability  $m$  to meet someone with money. That feature seems to be model-specific and perhaps a little problematic, from the historical point of view. In this respect, one should perhaps restrain from making welfare comparisons between the two types of economies that are represented here.

Note for example that if the discount rate is negligible, the money economy cannot achieve a surplus greater than  $(u - c)/4$  which is inferior to the credit economy unless the monitoring consumes half the surplus.

It seems to me that distinction between the credit economy and the money economy is exactly the right one to make. Here, theory and history meet. In a great insight, Kocherlakota showed<sup>4</sup> that the money can, under some conditions, replace the memory of past individual transactions. The “memory economy” should be the same as the “credit economy” in this paper and the model should be adapted accordingly.

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<sup>3</sup>Lagos, R. and R. Wright (2005), “A Unified Framework for Monetary Theory and Policy Analysis,” *Journal of Political Economy*, Vol. 113, 463-484.

<sup>4</sup>Kocherlakota, Narayana, R. (1998). “Money Is Memory,” *Journal of Economic Theory*, Vo. 81, 232-251 (mimeo).



The memory economy seems indeed to have been the historical setting before the introduction of coins. “Money” was used as a unit of account long before the appearance of coins. For example, on an inscription near the funary temple of Khafre: (second pyramid)<sup>5</sup>:

“(…) He says: ”I have bought this house from the scribe Tjenti. I have given 10 ”chats” for it: one piece of cloth with four threads (?), 3 shats; one bed, 4 shats; one piece of cloth with two treads (?), 3 shats.”

In the setting of Ancient Egypt, transactions were essentially local, repeated year after year around the yearly cycle, with potential crises when depending on the level of the Nile. The Nile was like an alley from which one could observe the production left and right on a narrow strip. (In the delta, things were a little different but no land was very far from a waterway). Centuries of data had produced good information. It seems that the cadastre in the Middle Kingdom was less imperfect than in France before the Revolution. The production could be predicted accurately by measuring the rise of the water level through the Nilometers along the river and plenty of records from past observation. For cereals, the state could control the input of the seeds and the output. <sup>6</sup>

In Mesopotamia, money seems also to have been used as a unit of account (shekel) with a reference to silver but with no silver coins. Mortgage contracts could be written before the introduction of coins.

The first introduction of coins seems to have been done in a fast process that started in Lydia (in the Western part of current Turkey) around 600 BC. The first coins were a mix (in about equal parts) of gold and silver (electrum) that was found locally. There are many issues on the trade value (by tale or by weight), the value of the smallest coin, which was probably higher than small change.<sup>7</sup> The gold/silver mix varied between coins but their

<sup>5</sup>Daumas, F. (1977). “Le problème de la monnaie dans l’Egypte antique avant Alexandre,” *Mélanges de l’École Française de Rome*, Vol. 89, 425-442.

<sup>6</sup>Jones, *Taxation in Antiquity*, 156-157; Manning, Joseph (2009), *The last pharaohs. Egypt under the Ptolemies, 305-30 BC*, Princeton University Press.

<sup>7</sup>Again, this note is not a review. See in particular, with the included references, Velde, François, R. (2013)., “On the Origin of Specie,” mimeo; Bresson, Alain (2006), “The Origin of Lydian and Greek Coinage: Cost and Quantilty,” mimeo; Mundell, Robert, A. (2002). “The birth of coinage,” [Working paper](#).

weight were remarkably close. My impression is that this could fit with a circulation by tale where weight outliers would immediately be identified as bad money. (The gold/silver mix could be assessed to some extent by professionals through the touchstone). In any case, the phase with electrum coins was relatively short, less than a century. Gold and silver coins were established in the middle of the sixth century. Bimetallism would be the foundation of monetary systems until the advent of paper money.

It is perhaps not surprising that money-coins would be introduced and then quickly spread around the Aegean sea. Following the framework of Kocherlakota, one can imagine a context in which keeping the records of past transactions could be costly when these transactions take place between different islands. There may have been a mix between “money” and “memory” (also discussed briefly in Kocherlakota) in which small transactions were done in “memory” and did not coins for small change. Whatever the historical issues (which seem to need some investigations), the paper I am discussing here would benefit from an analysis of a given structure of transactions with different record keeping costs and a mix between credit/memory and coins/money.

To conclude, I would like go back to the main literary source on the introduction of coins, the text of Herodotes (writing around 450BC). His placing (in Lydia) of the creation of coins and his dating are in agreement with the archeological evidence in hoards and on this issue perhaps, he seems to have been accurate. That text is well known but is rarely quoted entirely and the details may actually matter for the monetary economist.

Histories, I, 93, 1-4:

There are not many marvelous things in Lydia to record, in comparison with other countries, except the gold dust that comes down from Tmolus. [2] But there is one building to be seen there which is much the greatest of all, except those of Egypt and Babylon. In Lydia is the tomb of Alyattes, the father of Croesus, the base of which is made of great stones and the rest of it of mounded earth. It was built by the men of the market and the craftsmen and the prostitutes. [3] There survived until my time five corner-stones set on the top of the tomb, and in these was cut the record of the work done by each group: and measurement showed that the prostitutes' share of the work was the greatest. [4] All the daughters of the common people of Lydia ply the trade of prostitutes, to collect dowries, until they can get themselves husbands; and they themselves offer themselves in marriage.

I, 94, 1:

The customs of the Lydians are like those of the Greeks, except that they make prostitutes of their female children. They were the first men whom we know who coined and used gold and silver currency; and they were the first to sell by retail.

The text shows that the introduction of money went together with the development of retail activities. Of course, one can indeed understand that some women in Lydia preferred to substitute in their dowries *money* for *memory*.