# Money as numeraire: doctrinal aspects and contemporary relevance\*

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#### 1. Introduction

A fundamental issue in monetary economics is the question: "What is money?". At the beginning of the twentieth century, the majority of writers on money took it for granted that the primary function of money is its role as a medium of exchange. They regarded it a necessity that money should consist of, or be backed by, a commodity, generally gold, silver, or both (Schefold 1987, p. 54; Davies 1994, p. 26). Writing in the context of the prevailing metallic standards, authors emphasised the similarities between money and other commodities, with the value of money determined by the same process of supply and demand that determines the prices of non-monetary commodities (Ellis 1935, p. 4; Cowen and Kroszner 1992, p. 390). They stressed the idea that the role of the state should be primarily that of guaranteeing

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<sup>&</sup>lt;sup>1</sup> See, for example, Wicksell (1911, English translation, 1935, vol. II, p. 7), who argued "only [the medium of exchange] is in a true sense characteristic of money". See, also, von Mises (1912, English translation, 1953, pp. 29-37).

"that the coins it mints really contain the weight of metal by which the monetary unit is defined [...] and it should take care that any fiduciary currency is kept up to [i.e., backed by] the value of the metal standard" (Rist 1940, p. 353).

The metallic monetary standards in place in the early part of the twentieth century were conducive to the view that the key role of money is that of a medium of exchange. After all, since what was designated as money was embodied in a physical object used in conducting transactions, the inferences that 1) money is primarily a means of payment and 2) the value of money derives from the supply of, and demand for, the particular commodity specified as money, followed. The transition from a commodity-money regime to a fiat-money regime during the course of the twentieth century was not accompanied by a change in understanding among the majority of economists about the key function of money. As was the case with their neoclassical predecessors, modern writers also stress the role of money as a medium of exchange. For example, Shubik (1987, p. 316) stated: "The most important function of money is as a medium of exchange; the next is as a numeraire". Similarly, in developing a model of a monetary economy, Champ and Freeman (2001, p. 22) argued: "In this model economy, therefore, fiat money serves as a medium of exchange".<sup>2</sup>

Although the view that money's key role is that of medium of exchange has dominated the profession for over one hundred years, beginning in the second half of the nineteenth century, another, more subtle, view emerged. The latter view, referred to as the chartalist theory of money, assigned primacy to money's role as a numeraire and stressed the role of the state in the creation of money. Unlike the neoclassical tradition, chartalist theory was able to explain the existence of both paper money and commodity money. As Rist (1940, p. 334) noted, before the development of chartalist theory, "the majority of economists had refused to put paper money and metallic currency in the same boat".

This paper deals with the doctrinal development of the chartalist theory of money and considers its contemporary relevance. Briefly to anticipate, chartalist theory separates the unit-of-account function of

<sup>3</sup> The origination of the term "chartalism" is discussed below in section 3.

<sup>&</sup>lt;sup>2</sup> We could point to many similar statements. Textbook examples include Krugman and Obstfeld (2000, p. 364) and Williamson (2005, p. 350).

money from the medium-of-exchange function, with primacy accorded to the unit of account. Effectively, the numeraire quality in and of itself constitutes what Aschheim and Tavlas (1996) have called "embryonic money". As we demonstrate, a monetary, as opposed to a barter, economy cannot exist in the absence of a numeraire, but it can exist without a medium of exchange. In essence, the numeraire (dollar, pound, franc) provides the basis for the arithmetic required for keeping score in the economic game; without the monetary unit, the calculation of exchange ratios among different goods, services and financial claims would be impossible (Timascheff 1939, p. 155; Eagly 1964, pp. 350-51). Consider, for example, an economy in which there are only five goods, but no numeraire. In such an economy, there would be ten bilateral exchange ratios and thirty triangular exchange ratios to consider.<sup>4</sup>

We single-out three authors - Alexander Del Mar, Georg F. Knapp and John Maynard Keynes - as the main progenitors of the chartalist theory of money. Essentially, these authors posited the following conditions needed for a regime change from a barter economy to a money economy: 1) the identification of a unit of account, in terms of a name, description, or a symbol, to measure the value of exchanges, both present and deferred; 2) the declaration by the state of what thing (or object), whether a commodity or paper, corresponds to the unit of account; 3) the enforcement by the state, backed by the legal power of the state to impose and collect taxes, of payment of the thing that corresponds to the unit of account. These authors recognised that, in primitive societies, condition 1 above - i.e., identification of a unit of account - typically occurred prior to both the declaration by the state of the object that corresponds to the unit of account (i.e., condition 2) and contract enforcement by the state (i.e., condition 3). The latter two conditions assured that, whatever the object the state designated to be money, it would be generally acceptable in transactions and as a store of value. The chartalist theory developed by these three authors involves each of the above three conditions.<sup>5</sup>

<sup>&</sup>lt;sup>4</sup> Likewise, n commodities give rise to n(n-1)/2 bilateral exchange ratios and to n(n-1)(n-2)/2 triangular cross ratios.

<sup>&</sup>lt;sup>5</sup> The view that money is primarily a numeraire has had a long history. For example, Aristotle (quoted in Monroe 1924, pp. 28-29) wrote: "Money, therefore, is like a measure of value that equates things, by making them commensurable [...]. There must be some single standard then, and that a standard upon which the world agrees; hence it is called money". Among modern writers, Brunner and Meltzer (1971) and Hayek (1976) stressed the informational role played by money as a unit of account.

What follows consists of six sections. Section 2 describes the origination of chartalist analysis, as embodied in the above three conditions, by Del Mar. Section 3 discusses Knapp's theory and the primacy accorded to the unit of account, a feature of his monetary analysis that has been overlooked by most modern interpreters of his work. Section 4 describes Keynes's extension of chartalist theory. Section 5 assesses the contributions of the three authors considered, showing that, in effect, the insights of these authors constitute the core of chartalist theory to the present day. Section 6 describes the relevance of the chartalist theory to contemporary monetary and business-cycle theory and currency-area formation. We show that neglect of the unit-of-account function of money - that is, that once a numeraire is identified one moves from a barter to a monetary economy - can lead to logical inconsistencies, as is the case in Wicksellian business cycle dynamics and modern general-equilibrium analysis. Section 7 presents concluding observations.

### 2. Del Mar and the origination of the chartalist theory of money

Alexander Del Mar developed chartalist theory in the second half of the nineteenth century. A writer neglected by both his contemporaries and subsequent generations of economists, beginning in the early 1860s Del Mar wrote some thirty-six books and monographs and numerous articles on monetary economics, monetary history and economic statistics. Although chartalist theory is also contained in many of his other writings, in what follows three of Del Mar's writings are drawn upon to delineate his contributions: 1) History of Monetary Systems, published in 1895; 2) the second edition of The Science of Money,

<sup>6</sup> Goodhart (1998), however, drew attention to the importance of the distinction between the medium of exchange and unit of account functions of money.

<sup>&</sup>lt;sup>7</sup> A biography of Del Mar, provided in Aschheim and Tavlas (1985), discussed Del Mar's monetary theory and his influence on Irving Fisher. Aschheim and Tavlas (1985) also documented the extent that Del Mar has been neglected by the economics profession. Subsequently, Aschheim and Tavlas (2004), Klein (2004) and Mundell (2004) discussed possible reasons for the neglect of Del Mar. Tobin (1985, p. 35) called Del Mar a "great scholar" and one of the three "important predecessors" (along with Simon Newcomb and J. Lawrence Laughlin) of Irving Fisher in the United States in the field of monetary economics.

published in 1896, which represents the most complete statement of his work on monetary economics;<sup>8</sup> and 3) *The Law of Payment*, a book published in 1900 and which has not been previously cited in the literature.<sup>9</sup>

Del Mar sought to determine the particular quality that gives valuableness to money. The "true guide" to the study of monetary issues, he argued, "is to be found in history, and the basis of that history is the nature of value" (1896, p. 47). What light does history shed on the valuableness of money? Del Mar discerned that the progression from a barter economy to a money economy involved the adoption of a commodity to serve as a unit of account:

"The earliest form of exchange [...] was barter. To remedy those inconveniences of barter which were disclosed by a progressive civilisation, some given commodity of common necessity and production was selected in each community as a rude measure of the value of other commodities. Such measure, whether it consisted of a number of beans, cloths, shells, or lumps of metal, enabled any given exchange to be effected upon a more equitable basis than before, simply by its operation in holding a vast number of parities in view at once (1895, p. xxxi).

A monetary framework based on commodities was, according to Del Mar, defective, because it lacked precision; the slightest difference in the quality or size of the commodities became matters of consideration during the act of effecting exchanges; thus, their effectiveness as measures of value was impaired (*ibid.*, p. xxxii). To remedy this deficiency, it became necessary to devise measures of value of uniform quality, fineness, size and weight:

"[...] this could best be done with the precious metals, and thus a number of metallic pellets, sometimes rings (baugs), came to compose a measure of value, which, nevertheless, was a very rude one" (1896, p. 61).

<sup>&</sup>lt;sup>8</sup> The first edition of this work was published in 1885. It also presented Del Mar's legal theory of money, but that edition is considerably shorter than the second edition. Three later editions of *The Science of Money* differ from the second edition only with respect to the introductory chapter.

<sup>&</sup>lt;sup>9</sup> The Law of Payment was published by The Cambridge Encyclopaedia Company, which was owned by Del Mar. The only known copy of this book is in the Department of Rare Books and Special Collections, Princeton University Library.

Eventually, argued Del Mar, each community made its own pellets or baugs, stamping them with its seal or private symbol. This act converted the pellets or baugs into coins. He argued:

"To render this device of home-made coins effective, it was necessary to forbid the use of all other coins. Here is where the law first came to the rescue of the local measure of value; and here is where numbulary history begins" (1895, p. xxxii, italics supplied).

Thus, Del Mar, discerned that a fundamental lesson to be drawn from history is the need to develop a "device" or "system" that can measure value (1896, p. 62). Yet,

"unlike length, weight capacity, etc., value [is] not an intrinsic or inalienable attribute of matter, and therefore [cannot] be measured by means of any commodity as a commodity, but only by symbols representing numbers, in short by means of a nummulary system" (ibid.).

The use of a symbol as a unit of account allows the prices of all other goods and services to be expressed in fractions or multiples of one monetary unit: "the unit of money is both the whole volume of money and each [...] fraction of it" (1895, p. 394). Because of the difficulty of obtaining sufficient and regular supplies of the precious metals for coinage, such a nummulary device, he argued, was employed in several ancient Greek states during the sixth and fifth centuries B.C.:

"The device consisted of a limited and publicly known number of named counters belonging to and issued by the state (commonly discs of purposely rotted sheet iron or of bevelled bronze), having little or no value as pieces of metal, but (when regarded as a whole) possessing great and definite value as a public measure [...]. The state [...] gave them the names of coins previously in use; it endowed them with the function of legal tender for the payment of all debts, claims, purchases and taxes; and rendered these ordinances effective and permanent by limiting the issue of counters, and taking means to protect them from being counterfeited. In a word, money became a public instrument, owned and controlled by the state (*ibid.*, pp. 62-63).

Thus, the valuableness of money, Del Mar determined, is to be found in its capacity to measure the value of all things with equity and precision (*ibid.*, p. 3). In this connection, he noted that

"money measures not merely the value of certain commodities and services at one time and place, as barter does; money measures all commodities at all times and places. Barter can measure all exchanges, each one by itself; money can measure all exchanges, both present, deferred, and involved" (*ibid.*, p. 3).

He queried: "Made of what substance?". "Theoretically", wrote Del Mar, "anything you like, so long as they cannot be multiplied by counterfeiters, nor lessened by monopolists and hoarders" (*ibid.*, p. 47).

Del Mar believed that the unit of account is a necessary, but not sufficient, condition for the existence of money. As the above discussion indicates, the law plays a decisive role in validating the unit of account, transforming it into money:

"[...] it is the law that creates money, gives it existence and imposes upon it denominational value. Take [the] legal name from [metallic money], and it is no longer money, but only bullion [...]. It follows that the efficacy [i.e., valuableness] of money is due to the value imposed upon it by the law, a fact deductible from its Greek name nomos and its Roman name nummus, both of which mean the law, or that which is created by law" (1900, p. 48).<sup>10</sup>

The state's proclamation, he believed, is crucial because of its legal authority to enforce contracts, impose and collect taxes, and force out the means of payment to private economic agents (1896, p. 35).

Del Mar also recognized that the unit-of-account function of money applies not only to the relative prices of goods and services, but to general purchasing power as well. In its latter capacity, money serves as a yardstick. Yet, as a measure of general purchasing power, money is an imprecise yardstick:

"Money is used to determine a kinetic and variable relation, other measures, to determine a statical and fixed one. Value varies with time and place; it also varies with the frequency of exchanges in time. Hence value is a variable relation which money has to determine; whilst that which a yardstick determines is an invariable and fixed relation. The determination of a yardstick will last forever, whilst a determination of money in price is only valid for a given time and place" (*ibid.*, p. 124).

<sup>10</sup> See, also, Del Mar (1895, p. iii).

Because money is an imprecise measure of value, Del Mar argued "there is no such thing as a unit of value" (*ibid.*, p. 50). The unit in which general purchasing power is measured changes as the supply of money changes (*ibid.*, p. 52). The unit of value cannot be one coin; it

"must be all the coins within a given legal jurisdiction [...]. The measuring value of [...] a yardstick is not affected by the multiplication or diminution of [...] yardsticks. Such is not the case with money [...]. The whole sum of money is therefore the true and the only unit of value" (*ibid.*, p. 53).

As demonstrated in the above discussion, Del Mar set forth the three core components of chartalist theory, namely, that the generation of a monetary economy is contigent on 1) the emergence of a unit of account, 2) the sanction of the unit of account by the state and 3) the ability of the state to enforce its proclamation as to what constitutes the unit of account through its authority to collect taxes and emit incomes to private agents. He considered the substance used to constitute money to be irrelevant.

Using the quantity-theory framework, Del Mar also perceived that changes in the money supply generated changes in prices and profits through a dynamic transmission mechanism, resulting in the business cycle. Therefore, to maintain a stable measure of value, Del Mar proposed that the state should limit the rate of increase in the supply of money. In his empirical work, he estimated that the average annual increase in output over the long term in the United States had been 3.3%. Accordingly, in order to attain price level stability, he proposed that the growth of the money supply should be regulated so as to increase by 3.3% per year (*ibid.*, pp. 199-200). 12

<sup>&</sup>lt;sup>11</sup> Based on his empirical investigations, he perceived that, in the long run (which he estimated to be about ten years), changes in the money supply had a proportionate effect on prices. In the interim, changes in money also affected output (see Aschheim and Tavlas 1985).

<sup>&</sup>lt;sup>12</sup> The same policy norm was proposed in the first edition of *The Science of Money* in 1885 and was the first quantitative money-supply growth-rate rule proposed in the literature (see Aschheim and Tavlas 1985).

### 3. Knapp's chartalist theory of money

In 1905, Georg Knapp, a German economic historian, published a book that contains his chartalist formulation, translated into English and abridged in 1924 as *The State Theory of Money*. Knapp sought to ascertain the character of money, its *capacity* to have value. Rather than dealing with the forces that determine the *value* of money, Knapp was concerned with understanding the *valuableness* of money. In so doing, he posed and confronted the fundamental question: "What is money?" (1924, p. 37).

Knapp observed: "[...] in human society a definite commodity [such as gold, silver, or copper], or, more accurately, a definite material grew into a means of payment" (*ibid.*, p. 25). This means of payment, which he called "exchange commodity", eliminated the complexities of barter transactions by acting as a vehicle in exchange between other commodities. In Knapp's view, however, such exchange commodities are not money. It is not, he believed, the physical embodiment of the vehicle commodity that determines the valuableness of money. Unbacked paper money also serves as a medium of exchange, he argued, yet it is made of material that is essentially worthless. What quality, then, provides *both* commodity money and fiat money with *the ability* to function as money? To uncover what he called the "soul" of money (*ibid.*, p. 2), Knapp sought to determine the essential characteristic that an exchange commodity and paper money have in common.

To pin down this common characteristic, it was necessary to discern what unique quality of the material embodied in the exchange commodity constitutes the genesis of money, without the exchange commodity having reached the stage of actually being money. The answer, according to Knapp, is that the material bears "units of value [i.e., units of account]" (*ibid.*, p. 7). In turn, "the unit of value is nothing but the unit in which the amount of payment is expressed" (*ibid.*, p. 8). In other words, it is simply a name. Yet, the name, whatever it might be, is of enormous consequence. According to Knapp (*ibid.*, p. 8):

"Every traveler entering a new country asks the name of this unit – whether accounts are in marks, francs, crowns, or sterling. When this question is answered, the traveler asks what the usual means of payment look like and what they are worth in the unit of that country. He is then in a position to make payments himself. We

see that the unit of value has everywhere a name which in some countries has remained unaltered for centuries (pound sterling), while in others (e.g., Austria) it has been deliberately changed" (italics supplied).

Underpinning Knapp's conception, that the unit of account is the essence of money, was his view that the monetary unit, among all values, is unique. Its value is commonly thought of as one. Money is not the thing being measured, but the yardstick against which the prices of other goods are expressed. "We always use the means of payment", he observed, "as a standard of comparison" (ibid., pp. 30-31). 'Oneness' arises because the basic unit of any money is one; a franc, for example, is always expressed and denominated in multiples or fractions of one franc. It is this oneness that provides the basis for the formulation of relative prices of all other goods and services. The prices of all other goods and services are expressed in fractions or multiples of one monetary unit. As Ellis (1935, p. 15) put it in his exegesis of Knapp:

"Oneness, not in the sense of coherence, but in the sense of equivalence of the unit of account, necessarily permeates our conception of the value of a piece of money".

If, however, the unit of account is the primary function of money, and exchange commodities such as gold and silver embody units of account, what prevents exchange commodities from being money? The unit of account, Knapp argued, can exist independently of the exchange commodity (the particular material). It is this unit, irrespective of whether it is embodied in a substance, that constitutes the essential quality of money. In the case of metal standards, the unit is named in terms of the material composing it and always coincides with the unit weight of the material (*ibid.*, p. 22), though there can be exceptions. The franc and the crown, for example, do not connote a fixed weight of metal. They are abstract units, or symbols. Yet, these symbols form the core of a money economy because each possesses the quality of 'oneness', thereby serving as a numeraire against which the prices of non-monetary goods and services can be expressed.

Knapp believed that a unit of account is a necessary, but not sufficient, condition for the existence of money. He argued that the existence of money begins at the time the state steps in and either affirms

or changes the unit of account (*ibid.*, pp. 19-25). Consider the latter case. Suppose, as Knapp did, that custom (though not the legal authority) has established copper as an exchange commodity. In that case, a unit of copper (say, a pound) would be the unit of value. The unit of copper is a necessary, but not sufficient, condition for the existence of money. Suppose, also, that the state enters the scene and declares that silver is to replace copper as the means of payment. Once the declaration is made,

"the law should settle a name for the new unit of value [silver] and call the new means of payment by it. By this means the validity of the new means of payment is established in units of value [...]. [The] State says that the unit pound of silver takes the place of so many earlier units, e.g., fifty pounds of copper" (ibid., pp. 21-22).

#### Thus,

"the new unit [...] consists in the declaration as to how many new units are legally equivalent to one old unit. This definition has absolutely nothing to do with the material in which the old means of payment consisted, nor yet the new. It only contains the proportion of the new to the old unit of value, *i.e.*, it relates the new unit back to the old one" (*ibid.*, pp. 21-22).

### Thus,

"the concept means of payment is freed from the actual nature of the material, e.g., is indifferently copper or silver, but remains bound to the condition that there should be some material" (*ibid.*, p. 25).

To recapitulate, the essence of money, in Knapp's view, is its capacity to serve as a unit of account, providing the quality of 'oneness' against which the prices of all other goods can be expressed. Commodities, such as gold or silver, can and do serve as units of account but do not qualify as money until the state steps in and either confirms or changes the unit of account. Thus, the state's proclamation is needed to make a unit of account money.

Why is the state's proclamation crucial? Knapp argued the state possesses power to effectuate its proclamation by forcing private agents to accept it and, when emitting it, acknowledges that it will accept the particular means of payment at face value for taxes due (*ibid.*, pp. 52)

and 176-77).<sup>13</sup> In this way, he arrived at the conclusion that the necessary and sufficient conditions for the existence of money are 1) a unit of account, which can be an abstract symbol; 2) the proclamation by the state that a particular unit of account is money and 3) the legal power of the state to impose and collect taxes denominated in that unit of account. "The soul of currency", he wrote, "is not in the material of the pieces, but in the legal ordinances which regulate their use" (*ibid.*, p. 2).

With the foregoing conception of the valuableness of money, Knapp explained the existence of unbacked paper money. He noted that, when the state first proclaimed a certain (metallic) means of pay-

ment as money,

"the chief consideration was that it should be possible to recognise immediately the nature and quantity of the metal, which had formerly [i.e., before the state's proclamation] been used by weight" (ibid., p. 35).

Therefore, the pieces of metal were stamped so that the means of payment could be easily recognised. Over time, however, it was recognised that the pieces could become worn down, yet still pass as money. 14 When this event occurs

"it is not the statement of a specific material, but the *description* of the shaped pieces, which makes the means of payment recognisable" (1924, p. 37, italics supplied).

The description of the shaped pieces matters because, by describing the pieces, the state names the unit of account. Consequently, money could be made to resemble "tokens or tickets" that is, it could be made of paper:

"Perhaps the Latin word 'charta' can bear the sense of ticket or token, and we can form a new but intelligible adjective – chartal. Our means of payment have this token, or chartal form" (*ibid.*, p. 32).<sup>15</sup>

14 Knapp had in mind the wear and tear that occurs from regular use. He did not

formulate a theory of seigniorage.

<sup>&</sup>lt;sup>13</sup> The importance of the state in collecting taxes for determining what constitutes money was recognised by Smith (1937 [1776], p. 312): "A prince who should enact that a certain proportion of his taxes should be paid in a paper money of a certain kind, might thereby give a certain value to this paper money".

<sup>&</sup>lt;sup>15</sup> The use of the word chartal subsequently became (and continues to be) widely used as a description of fiat money (Goodhart 1989 and 1998).

Knapp did not develop a theory of the determination of the purchasing power of money. 16 Therefore, he found it difficult to discern that money could *lose* or *gain* value. Although he accorded primacy to the unit of account, he failed to perceive that the yardstick, itself, could vary in length; money does not provide an unalterable measure. Nor did he fully comprehend the significance of Gresham's Law, which he dismissed as a "half truth" (*ibid.*, p. 162). In any system in which the state has proclaimed more than one legal tender, the moneys quoted at a premium lose the validity proclaimed for them by the state (Ellis 1935, p. 27).

#### 4. Knapp's influence on Keynes

Keynes began his Treatise on Money by stressing the primacy of the unit of account. "Money of account", he wrote, "namely that in which debts and general purchasing power are expressed, is the primary concept of a theory of money" (1930, p. 3, original italics). He observed that a money of account comes into existence with the establishment of "price lists", which he characterized as "offers for contracts for sale or purchase", and the creation of "debts", which he called "contracts for deferred payment" (ibid., p. 3). Like Del Mar and Knapp, Keynes argued that the existence of the unit of account, and not the medium of exchange, is a necessary condition for the transformation of a barter economy into money economy:

"Money itself, namely that by delivery of which debt contracts and price contracts are discharged, and in the shape of which a store of general purchasing power is held, derives its character from its relationship to the money of account, since the debts and prices must first have been expressed in terms of the latter. Something which is merely used as a convenient medium of exchange on the spot may approach to being money, inasmuch as it may represent a means of holding general purchasing power. But if this is all, we have scarcely emerged from the stage of barter. Money proper in the full sense of the term can only exist in relation to a money of account" (ibid., original italics).

<sup>&</sup>lt;sup>16</sup> Knapp was widely criticised for this omission. Ellis (1935, p. 27) provided a list of early critics. See, also, Rist (1940, pp. 362-63) and Schumpeter (1954, p. 1091).

Keynes distinguished between the *description* of the shaped pieces that make the medium of exchange recognisable, and the specific material with which the medium of exchange is comprised. The former, he argued, is the crucial characteristic of money because it implies a unit of account.

"Perhaps we may elucidate the distinction between money and money of account by saying that the money of account is the description or title and the money is the thing which answers to the description. Now if the same thing always answered to the same description, the distinction would have no practical interest. But if the thing can change, whilst the description remains the same, then the distinction can be highly significant" (ibid., original italics).

Keynes proceeded to elucidate a state, or legal, theory of money. He noted that the use of the word "contracts" in association with price lists and debts brings "law or custom, by which [the contracts] are enforceable" into the picture (*ibid.*, p. 4). Therefore, "we have introduced the state or the community" (*ibid.*). The state, Keynes argued, has two essential legal functions associated with money. First, the state possesses the legal power to name the unit of account and to declare what thing corresponds to the unit of account. Second, the state "comes in [...] as the authority of law which enforces the payment of the thing which corresponds to the name or description of the contract" (*ibid.*). Moreover, the state has the right to vary its declaration of what thing corresponds to the unit of account:

"This right is claimed by all modern States and has been so claimed for some four thousand years at least. It is when this stage in the evolution of money has been reached that Knapp's chartalism – the doctrine that money is peculiarly a creation of the State – is fully realised. Thus the age of money has succeeded to the age of barter as soon as men had adopted a money of account. And the age of chartalist or State money was reached when the State claimed the right to declare what thing should answer as money to the current money of account – when it claimed the right not only to enforce the dictionary but also to write the dictionary. Today all civilised money is, beyond the possibility of dispute, chartalist" (*ibid.*).

Such views continued to characterise Keynes's thought in his later writings. In a 1937 commentary on the *General Theory* (1936), he wrote that money serves "two principal purposes", those of unit of ac-

count and store of wealth (Keynes 1937, p. 115).<sup>17</sup> Listing the unit of account first, he observed: "By acting as a money of account it facilitates exchanges without its being necessary that it should ever itself come into the picture as a substantive object" (*ibid.*, p. 115).

Whereas Knapp (but not Del Mar) failed to develop a theory of the purchasing power of money, or to address the relationship between the unit of account and the purchasing power of money, in the *Treatise* Keynes placed the theory of the value of money at centre stage. As discussed above, he argued that the unit of account is the means in which both relative prices and "general purchasing power" are expressed (1930, p. 3). Book II (i.e., chapters 4 through 8) of the *Treatise* deals with the various index numbers that can be used to measure general purchasing power. In Book II Keynes stated that

"The money of account – with which we began chapter 1 – was devised long ago to satisfy the need for a term in which to express general purchasing power. A definite measure of purchasing by means of index numbers of prices is, however, a conception of modern times" (ibid., pp. 48-49, original italics).

With regard to the theory of the value of money, in the *Treatise* Keynes sought to extend the quantity theory of money to an economy with a developed banking system and to analyse the dynamics of the movement from one equilibrium position to another in such a system (Klein 1947, pp. 17-18; Patinkin 1987, pp. 21-23).<sup>18</sup>

<sup>&</sup>lt;sup>17</sup> In Chapter 17 of *The General Theory* (1936), Keynes decoupled the unit-of-account function of money from the store-of-value function. With the existence of multiple potential moneys, he noted that private agents may wish, under certain conditions, to keep their wealth in a money other than the legal one. This view foreshadowed the recent experience of some developing countries during periods of high inflation in those countries, with the local legal unit of account *de facto* indexed to the one chosen by private agents. We are grateful to a referee for drawing our attention to this argument.

<sup>&</sup>lt;sup>18</sup> Thus, Klein (1947, p. 18) noted that "Keynes did not regard his [analysis] as formally incompatible with the quantity theory; rather he thought [it] brought to light certain processes obscured by the traditional doctrine". For a similar view, see Patinkin (1987, p. 23). As noted above, Del Mar also developed a dynamic version of the quantity theory.

#### 5. Evaluation

On the basis of the above discussion of the contributions of Del Mar, Knapp and Keynes, the following conclusions emerge. First, credit for the origination of chartalist theory, in terms of the three conditions set forth in section 1 above, should go to Del Mar. In fact, however, such credit is typically accorded to Knapp who, while making significant contributions, did not originate chartalist theory. For example, Ellis, in his classic study German Monetary Theory: 1905-1933, observed that "it is universally recognised [that Knapp's State Theory] represented a milestone" in the development of chartalism (Ellis 1935, p. 12). Wicksell (1907, reprinted in Sandelin 1999, p. 219) stated "in terms both of its content and its form [...]. [The State Theory] is to be counted among the pearls of economic literature". Schefold (1992, p. 54) credited the State Theory as having launched a "counter revolution" against the neoclassical view that money should consist of, or be backed by, a commodity. None of these writers cited Del Mar, to whom, we argue, some credit for originality and perceptivity is due.

Second, chartalism involves more than the idea that the state decides what is money. Each of the three writers we discussed perceived that the existence of the unit of account establishes the core of a money economy. A unit of account, but not a medium of exchange, is a necessary condition for the existence of a money economy. Although the origins of a money economy may involve the adoption of a particular commodity, the key attribute of the commodity, the one that underpins its moneyness quality, is its role as a unit of account. An embryonic money economy replaces a barter economy when a unit of account is adopted. A full monetary economy requires validation of the numeraire by the state. There have been instances in history in which the unit of account has existed in the absence of a medium of exchange. In such situations, transaction chains may be long and cum-

<sup>&</sup>lt;sup>19</sup> As discussed above, however, the historical origins of money, according to each of the three writers considered, involve the use of a commodity to serve as a unit of account. The origins do not involve the use of an abstract unit of account. As Friedman and Schwartz (1986, pp. 44-45) pointed-out: "Two features of [...] history are striking. The first is that the unit of account has, invariably or nearly so, been linked to a commodity. We know of no example of a unit of account – a fiduciary or fiat unit such as now prevails everywhere, having emerged spontaneously through its acceptance in private transactions".

bersome, requiring a double coincidence of wants; yet, with a unit of account in place, the costs of information, calculation and uncertainty are greatly reduced and a core money economy exists.<sup>20</sup> There has been no documented experience in history in which a medium of exchange has existed in the absence of a unit of account.

Third, chartalism provides the common ground in the analysis of money in commodity-based and fiat-based systems. That common ground involves both the numeraire and the general acceptability of whatever object corresponds to the numeraire. As we have stressed, the emergence of a numeraire, even without state sanction, constitutes embryonic money. A full monetary economy involves, in addition, general acceptability of the object corresponding to the numeraire. Prior to the development of sovereign national states, fully-backed metallic coins established the basic condition for acceptability. With the development of the modern national state, it became possible to establish general acceptability even without metallic content or backing. Such acceptability of fiat money involves, in part, a declaration by the state. Yet, a simple declaration is not enough.<sup>21</sup> If, however, the state is willing to accept the proposed money in payment of taxes, then, everyone who has obligations to the state will be willing to accept that money and network externalities will be set in motion. This formulation was the essence of the state theory of money of Del Mar, Knapp and Keynes.

Fourth, other writers had pointed out, prior to Del Mar, Knapp and Keynes, that money is a creation of law. For example, Aristotle stated:

> "Money by itself is but a mere device. It has value only by law and not by nature, so that a change of convention between those who

<sup>&</sup>lt;sup>20</sup> The Giro system does not require double coincidences; transactions are simply carried on the books with settlement that could occur years into the future. Note that the state's proclamation of what constitutes the unit of account reduces information costs. Thus, Goodhart (1998, p. 411) pointed-out that "the costs of identifying the quality of either unworked or fabricated precious metals for the ordinary person is high". He (*ibid.*, pp. 411-12) went on to argue that "the identification problem was largely resolved by the technical innovation of a mint process, whereby the identification costs could be drastically reduced by means of stamping a quality guarantee upon a coin". Minting, however, requires protection and trust in the protector. In turn, trust requires "the establishment of law and order [which] involves and requires a governance structure" (*ibid.*, p. 413).

<sup>&</sup>lt;sup>21</sup> This argument was also made by Lerner (1947), who credited Knapp for its origination.

use it is sufficient to deprive it of its value and of its power to purchase our requirements" (*Politica*; quoted from Del Mar 1896, p. 27).

These other writers, however, emphasised money's role as a physical object. Therefore, they believed that the role of the state was to proclaim what material (e.g., gold) would correspond to money. The three writers we considered, by contrast, discerned that it is the description of the material that is crucial because money's primary function is to serve as a unit of account. In the case of the precious metals, the description corresponds to the weight of the material (e.g., ounce of gold). Once the description (i.e., ounce of gold) has been proclaimed, all parities are expressed in terms of that unit of account. That insight set Del Mar, Knapp and Keynes apart from previous writers on money. Moreover, that insight provides the core of much modern monetary analysis, as we now discuss.

### 6. The primacy of the unit of account: some contemporary examples

Present-day economic analysis assigns a subsidiary role to money's function as a numeraire. For example, Mankiw (2001, pp. 48-49) argued that "standard general equilibrium theory gives no role for the unit of account. Indeed, the numeraire is normally irrelevant". We argue to the contrary. As we discuss below, without the numeraire general equilibrium analysis would not be possible. We also argue that changes in the unit of account play a substantial role in modern theories of the business cycle, as derived, for example, from Phillips-curve analysis, and that the unit of account has played an under-appreciated role in the formation of monetary union in Europe.

## 6.1. Money in general equilibrium

To demonstrate the primary role of the numeraire in a general equilibrium framework, consider Walras's seminal formulation (1889) of a general equilibrium model. In his model, Walras incorporates the numeraire as an integral part of his system of equations. Each of his market-clearing equations is denominated in the numeraire. The existence

of a numeraire allows market clearing to occur through a continuous groping for prices. Prices emerge at the point of equation of the quantity supplied with the quantity demanded in individual markets. Yet this process of tâtonnement takes place without money's changing hands (means of payment) and without money's serving as a store of value. Consequently, it is the existence of money solely as a numeraire that allows for the distinction to be made between a money-exchange system and a barter-exchange system. The introduction of a numeraire involves a switch of regimes from a barter- to a money-exchange economy. The reduction in transaction costs (for example, the costs calculation, information and search) imparts a non-neutrality character to money. Recalling Marshall McLuhan's celebrated motto, "the medium is the message", we suggest that the message (that is, numeraire) is the medium! It was Walras's grasp of the numeraire role of money as essential for the economic calculus at the core of a money-exchange economy that has permeated the subsequent development of general equilibrium and capital theory.

Thus, we would argue that it was Walras's inclusion of the numeraire quality of money that imparted to his model the clear-cut character of a money-exchange as contrasted with a barter-exchange economy. This insight, however, has escaped most modern-day theorists. A representative example is Williamson (2005, p. 98) who, in his textbook *Macroeconomics*, developed a basic general equilibrium model.<sup>22</sup> In chapter 4 of his book, Williamson wrote:

"An important assumption we make at this stage is that there is not money in this economy [...]. Labour time is sold by the consumer in the labour market at a price w in terms of consumption goods. That is, one unit of labour time exchanges for units of consumption goods. Therefore, w is the real wage, or the wage rate of the consumer in units of purchasing power. Throughout, the consumption good plays the role of numeraire, or the good in which all prices and quantities are denominated. In actual economies, money is the numeraire, but in our barter economy model, the choice of

<sup>&</sup>lt;sup>22</sup> For a somewhat more formal analysis than that of Williamson, see Champ and Freeman (2001). The latter authors build a barter economy in which there is a numeraire. They consider a monetary economy to be one in which, in addition to the numeraire, "trade [involves] fiat money as a medium of exchange" (ibid., p. 36). We would suggest that their barter economy is, in fact, an embryonic money economy.

numeraire is arbitrary. We choose the consumption good as numeraire, as this is a common convention" (ibid., p. 98).

Chapter 4 of Williamson's text deals with consumer and firm optimization in a static framework. Subsequent chapters embellish the model with other features, including government behaviour and dynamic (two-period) analysis. It is not until chapter 10 that Williamson introduces a medium of exchange into the model, arguing that the inclusion of the medium of exchange transforms the model from a barter model to a monetary model (Williamson 2005, p. 396). We would argue, however, that models that feature a numeraire, but not a medium of exchange, are embryonic monetary models. By having earlier pinned down a numeraire, in this case the price of the consumption good, in his model, Williamson had already introduced embryonic money in his general equilibrium model. It is the ability of such models to reach market-clearing solutions, without a medium of exchange, that demonstrates the primacy of the numeraire.

#### 6.2. Wicksellian dynamics

The concept of neutral money has occupied a notable place in monetary theory, from neoclassical literature to the present. Considerable analytical effort has been devoted to establishing and elaborating the notion that, under particular conditions, the role of money is unimportant or superficial. At the core of this effort is Wicksell's pathbreaking formulation of the neutrality of the interest rate in a monetary economy. In what follows, we reconsider 1) the meaning of the neutrality of money and 2) the nature of the conditions that underpin such neutrality, in the light of our formulation of an embryonic money economy.

Wicksell did not specifically refer either to "neutral money" or to the "neutrality of money", but rather to a "neutral rate of interest". Thus, Wicksell (1936, p. 122) stated that:

"there is a certain rate of interest on loans which is neutral in respect to commodity prices, and tends neither to raise nor to lower

<sup>&</sup>lt;sup>23</sup> For a recent treatment of Wicksell's formulation, see Wooford (2003). For a critical appraisal of Wicksell's formulation, see Aschheim (1973).

them. This is necessarily the same as the rate of interest which would be determined by supply and demand if no use were made of money and all lending were effected in form of real capital goods. It comes to much the same thing to describe it as the current value of the neutral rate of interest on capital" (italics in original).

Hence, to Wicksell the neutral rate of interest is that rate that would obtain in a barter economy. His analysis of determination of the absolute price level involves a comparison of the money rate of interest with the neutral rate of interest. The money rate is neutral in respect to the absolute price level when it is equal to the rate of interest in natura, i.e., in a barter economy.

Suffice it to point out that it appears fallacious to posit equivalence between a particular money economy and a particular barter economy. Consider the attempt to identify the neutral rate of interest for a particular money economy, even apart from the problem of the term structure of interest rates. Should the money economy be compared with the barter economy that would follow the abolition of money in the short run or in the long run?

If the comparison is one involving the *short run*, the immediate aftermath of the shift from a money to a barter economy would be a reversal of the division of labour and specialisation of function attributable to the use of money. Thus, the economy would move to an integration of labor and a generalisation of function. In other words, the Wicksellian approach does not bring out the distinctiveness of a monetary from a non-monetary economy. Such a shift constitutes a lapse from the level and composition of economic activity that the immediate aftermath of the collapse of a monetary system in the wake of a hyperinflation may resemble. Alternatively, suppose that a *long-term* comparison is to be made between a particular money economy and the barter economy to which, after the abolition of money, it would eventually evolve. Even after full adaptation to the practice of barter, the indefinite protraction of the absence of money would constitute a lasting economic retrogression from the pre-existing money economy.

The defectiveness in Wicksell's dichotomy between the monetary economy and the barter economy leads to a logical pitfall in his cumulative-process analysis. That analysis involves a discrepancy between the market rate of interest and the natural rate, whereby the latter rate was inferred by Wicksell from his axiom that it derives from a barter-exchange economy. The logical pitfall in Wicksell's analysis is that a cumulative process meant to explain price-level movements cannot be deduced from an economy without money and, therefore, without a general price level.

Consequently, the concept of, and the conditions for, the neutrality of money derived from a Wicksellian system involve the connection of a monetary with a barter economy. We would argue that, being premised on the notion of a barter economy, the concept of, as well as the conditions for, neutral money are a contradiction in terms.

#### 6.3. Phillips-curve analysis

Modern theories of the business cycle typically rely on a Phillips-curve relationship of some sort. To demonstrate the key role played by the unit of account in such theories, consider the following three variants of the Phillips curve, each of which augments the Phillips curve with a term representing expected inflation.

- 1) The Friedman (1968) model. In Friedman's framework, price expectations are assumed to be formed adaptively. The business-cycle theory underlying Friedman's model is based on a transmission mechanism running from anticipated and/or unanticipated changes in the money supply to changes in prices and, via adaptive expectations, to sticky wages and changes in profits and output. Misperceptions by wage earners that the price level has changed lead to countercyclical changes in real wages and, therefore, to pro-cyclical changes in output.<sup>24</sup> In other words, it takes time for wage-earners to perceive that the value of the unit of account (that is, the parse level) has changed, which, in turn, generates business-cycle mechanics around the natural rate of unemployment. While changes in the quantity of money bring about the cycle, the way in which they do so works through changes in the value of the unit of account.
- 2) The Lucas (1980) monetary misperceptions model. The Lucas money-surprise model is a clear-cut example of the argument that the numeraire is the key function of money. The shift variable in this

<sup>&</sup>lt;sup>24</sup> Misperceptions by wage earners involve a certain degree of money illusion. For a discussion, see Aschheim (1977).

model is last period's expectation of the current-period inflation rate. Assuming rational expectations and perfectly flexible prices and wages, business-cycle mechanics are generated through less-than-perfect information about the price level. Workers are assumed to be situated on different islands and, following a monetary shock, face a signal extraction problem concerning how much a change in the price of the good each produces represents a change in relative prices and how much represents a change in the absolute price level. As in the case of the Friedman sticky-wage model, it is mis-information about changes in the value of the unit of account that generates the business cycle.

3) The New Keynesian Phillips Curve (NKPC). NKPC is a key component of much recent theoretical work on inflation. Unlike traditional formulations of the Phillips curve, the NKPC is derivable explicitly from a model of optimizing behavior on the part of price setters, conditional on the assumed economic environment (e.g., monopolistic competition, constant elasticity demand curves and randomlyarriving opportunities to adjust prices; see Walsh 2003, pp. 263-68). In contrast to the Friedman and Lucas specifications, in the NKPC framework current expectations of future inflation, rather than past inflation rates or past expectations of current inflation, shift the curve (Woodford 2003, p. 188). Also, the NKPC implies that inflation depends on real marginal cost and not on the gap between actual output and potential output or on the deviation of the current unemployment rate from the natural rate of unemployment, as is typical in traditional Phillips curves (Walsh 2003, p. 238).<sup>25</sup> In terms of business-cycle dynamics, the NKPC is similar to its Friedman and Lucas predecessors; temporary nominal price rigidities play a crucial role in generating the business cycle. Under Calvo random pricing, an increase in the money supply leads first to an increase in output because, in the short run, only some firms raise their prices in response to a rise in aggregate demand. As in the Friedman and Lucas models, in the long run price expectations fully adjust to the initial change in the money supply, so that there is no long-run inflation/unemployment rate trade-off. As is

<sup>&</sup>lt;sup>25</sup> A major advantage of the NKPC over the traditional Phillips curve is said to be that the latter is a reduced-form relationship whereas the NKPC has a clear structural interpretation so that it can be useful for interpreting the impact of structural changes on inflation. Mankiw (2001, p. 52) called the NKPC "the workhorse for much recent research on monetary policy". A theoretical assessment of the NKPC is provided in Swamy and Tavlas (2007).

the cases with those models, slow adjustment in the value of the unit of account (that is, inflation) underpins the cycle.<sup>26</sup>

#### 6.4. Optimum currency areas

According to the theory of optimum currency areas (OCA), the decision whether a country should join a common currency area depends on an analysis of the benefits of microeconomic efficiency (e.g., reduced transactions costs) against the costs of macroeconomic flexibility (Tavlas 1993).27 Although the OCA literature typically interprets the reduced transactions costs associated with a common currency as applying to private agents, several writers (Helleiner 2003, Pomfret 2005) recently stressed the reduction in public sector transactions costs stemming from a common unit of account. Specifically, Helleiner (2003, pp. 80-99) argued that the desire to reduce fiscal transactions costs was a major factor underlying the rise of territorial currencies in the nineteenth and early twentieth centuries. As governments began to centralize their capacity to collect taxes and spend money, the transaction costs for the state of extracting and deploying resources in a heterogenous national monetary system needed to be reduced. The transaction costs associated with assigning a value to the distinct monetary standards that existed in different parts of the territory were often very high. The creation of homogeneous territorial units of account was an outcome of the desire by states to overcome these fiscal transaction costs (*ibid.*, p. 96).

The foregoing line of reason applies to the formation of European monetary union (EMU). In this connection, Pomfret (2005, pp. 173-74) argued that one factor underlying EMU was the desire (among some economic agents) to move to a larger political federation, necessitating a larger budget. To do so, however, it was costly to set contributions and disbursements in a common currency when national curren-

<sup>&</sup>lt;sup>26</sup> Mankiw (2001, p. 49) presented a similar argument regarding the role of the unit of account in the NKPC business cycle.

<sup>&</sup>lt;sup>27</sup> Another approach used to assess whether a country should join a common currency area deals with the characteristics (e.g., factor mobility) that a country should possess in order to be able to forgo the use of an independent monetary policy and national exchange-rate adjustment. This approach has recently been extended by Dellas and Tavlas (2006).

cies' relative values were changing. Thus, one factor leading to the creation of the euro was the need to have a common unit of account for the area-wide public finances (*ibid.*, p. 172).<sup>28</sup>

Several other considerations relating to the connection between monetary union and the unit-of-account function of money deserve mention. First, the experience of EMU demonstrates that the formation of a monetary union depends foremost on a common numeraire. After all, before it was introduced in physical form in 2002, the euro had been solely a unit of account for three years, while national currencies continued to circulate as means of exchange. Second, a key advantage typically attributed to monetary unions is the decrease in information costs associated with a single currency, leading to increased price transparency and competition, and reduced market segmentation. In this connection, Engel and Rogers (1996), in a study of price differentials among cities in the United States and Canada, found that price differentials of identical products between Detroit and Windsor, which are just across the border from one another, are of the same order of magnitude as the price differentials between New York and Los Angeles. Thus, Engel and Rogers found that crossing the United States-Canadian border is equivalent in terms of the price differentials (of the same pairs of goods) to traveling 2,500 miles within the same country. We would argue that such border effects are important, at least in part, because of the existence of separate units of accounts.

#### 7. Conclusions

By endeavoring to explain what money is, Del Mar, Knapp and Keynes focused on the capacity of money to have value. Most early twentieth-century economists assumed that the valuableness of money derived from the commodity of which it was composed. They, therefore, focused on the medium of exchange function of money, a focus that has been superimposed onto analyses of fiat-money systems.

<sup>&</sup>lt;sup>28</sup> Pomfret (2005) argued that the desire to have a common unit of account to reduce public sector transactions costs in a federalist union has been a more important factor in the formation of European monetary union than the traditional OCA criteria.

Del Mar, Knapp and Keynes took one step back, seeking to uncover the core of a money economy. These writers each isolated the numeraire function of money, conferring upon it logical and historical precedence over the medium-of-exchange function. They showed that the initial stage of a money economy involves the adoption of a particular commodity to serve as a unit of account. The key attribute of this primitive money was its name, which provided uniqueness. A dollar, for example, is simply a name; but a dollar is always expressed and denominated in multiples or fractions of *one* dollar. The 'oneness' quality allows a vast number of parities to be held in view at once. In the cases of Del Mar and Keynes, the unit of account also served as a measure of general purchasing power. This chartalist view of money was easily amenable as an explanation of paper money. As Goodhart (1989, p. 34) pointed out, the

"substitution of fiat, paper money, for metallic coin as the main component of currency in the last 200 years provides strong support for the cartalist [i.e., chartalist] view that the monetary essence of currency can rest upon the power of the issuer and not upon the intrinsic value of the object used".

The primacy placed on the numeraire quality of money by Del Mar, Knapp and Keynes presaged contemporary monetary analysis. Under a fiat monetary regime, it is the state that determines what money is through its proclamation of the unit of account and its ability to collect taxes and disperse payments in the object corresponding to the numeraire, providing potency to its proclamation. The role of money as a numeraire underpins modern general equilibrium analysis and helps explain common-currency area formation. Changes in the unit of account are a key component of virtually all modern theories of the business cycle. Yet, most modern writers presuppose that the primary function of money is that of a medium of exchange, a carry-over conception from the age of gold. We would argue that the numeraire quality, which implies division of labor and specialisation of function, is the source of the distinction of a monetary from a non-monetary economy.

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