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Two ways on the path of
modern monetary theory

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Two ways on the path of modern monetary theory[*]

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Abstract

This paper shows that modern monetary theory can be better understood through the differences between Menger and Walras. Since the 1980s attempts to establish coherent microfoundations for monetary exchange have brought Menger's theory of the origin of money to the forefront and sent walrasian methods to the backstage. However, during the first decade of the XXIth century models inspired on mengerian monetary theory, mainly represented by the search monetary approach, are trying to reintroduce neo-walrasian elements. This paper aims at clarifying the main theoretical implications of this movement, through an analysis of the Menger-Walras divide on money. This divide allows us to show new proof of the deep theoretical differences among the so-called marginalist authors and of the richness of this historical period as a source for modern economics.

Introduction

The modern path of monetary theory evolved rapidly at the end of the XXth century. Alongside the traditional debate on the neutrality of money, the publication of the 1989 article of Kiyotaki and Wright marked a shift as it contributed to revive some old – but neglected – monetary issues. Indeed, a substantial number of models built since the 1970's can be seen as a return to Carl Menger's monetary framework for at least two reasons. First, most of the efforts were devoted to answer what Hellwig (1993) labeled the "Menger paradox", i.e. why agents are willing to exchange their production against goods or objects that are apparently useless for them because they do not consume them. Second, those models built upon a neo-Walrasian framework and gradually

incorporated important methodological requirements coming from Menger. Today the widely accepted methodology of monetary models consists in describing economies in which money can play an essential role as a medium of exchange (essential here means that it improves the welfare of agents compared to a barter economy or to a system of pure credit)[3], following exactly in Menger's footsteps. This debt to Menger's methodology is implicit in the early literature but it has been explicitly acknowledged by the search theoretical approach to money (Kiyotaki and Wright, 1989). Although the research on Mengerian issues is less prominent since the beginning of the new century, the shift in the methodology seems to endure (Williamson and Wright, 2010).

This paper aims at disentangling the various approaches to monetary theory. In particular, and inspired by De Vroey (2004), we argue that the recent history of monetary theory parallels the development experienced in macroeconomic theory. De Vroey shows that the history and evolution of macroeconomics may be understood comparing the Marshallian and the Walrasian models. He presents Marshallian models as focused on policy issues within a simpler framework than the one used by Walrasian models. He shows that the differences exist not only in contemporary models but also in the writings of the original authors. In this paper, we argue that the relevant divide to understand the history of monetary theory lays in the differences between Walras and Menger.

This paper highlights that Menger and Walras proposed two different ways to approach monetary theory. We show that this difference reflects divergences between their market and competition theory and that the goal they assigned to monetary theory also differed markedly. Menger pursued an explanation of the characteristics and institutions governing exchanges. He wanted to endogenously derive the use of money and gradually incorporated the various characteristics of money and their impact on the efficiency of the economy. His goal was therefore to explain how those institutions evolved as a response to difficulties agents experienced while trading. On the other hand, the main goal of Walras's monetary theory was to investigate whether the use of money was neutral, i.e. whether it may or not impact the relative prices in an economy in which money pre-existed agents. This gives a rational foundation to his theory of the control of money supply. We argue that these alternative and even opposite approaches to monetary theory are present since the so-called Marginal Revolution and they have – temporarily – been hidden by the domination of the General Equilibrium Model. The emergence of the search-theoretic approach to money may therefore be interpreted as a renewal of some of the key issues Menger dealt with.

Following Streissler's (1972) suggestion, our paper proposes a new insight in the debate on "de-homogenising" the contributions of Walras and Menger to economic theory (Jaffé, 1976) through

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3 As acknowledged by two leading authors in this field, these models include the overlapping generations model à la Samuelson, the spatial separation model à la Townsend (1980) and the search-theoretic approach to money (see Williamson & Wright (2010)).

their monetary theories[4]. Though the differences are underlined, we also acknowledge that both authors focus their analysis on the use of money as a medium of exchange. Both authors shared the idea that the use of money in payments derived from the absence of a double coincidence of wants. This is obvious for Menger readers. As for Walras, and following Rebeyrol (1998, 1999), his theory incorporates the availability service of money in order to explain that agents exchange their production for a good that has no direct utility for them. This happens because final allocations must be obtained in a decentralized context, after the setting of equilibrium prices on a centralized market. The problem of double coincidence of wants lies in the asynchronies in the obligations of payments of entrepreneurs, workers and those who own the capital. The use of money has then nothing to do with the inter-temporal allocation of resources; rather the cash balance is desired to overcome the difficulties of carrying out transactions (Rebeyrol 1998, 354). We explore the implications of this interpretation of Walras's theoretical construction as regards its internal coherence and the possible consequences for its followers.

This interpretation of Walras's theoretical construction has further implications. First, because money is introduced independently from the price setting mechanism the internal coherence of the assumptions has to be assessed. Second, because this interpretation is at odds with the view that the Walrasian model à la Arrow-Debreu cannot accommodate the use of money as a medium of exchange, we discuss how Walras's original writings differ from the Neo-walrasian tradition. We argue that the neo-Walrasian tradition would not be a true heir of Walras's analysis of money and its shortcomings cannot be extended to its forerunner. This reasoning is not completely in line with the modern attempts to provide micro-foundations to monetary theory. In this paper we show that there are different ways to deal with the microfoundations of money. Walras and Menger represent two alternatives on this subject.

In their article Arena and Gloria-Palermo (2008) proposed a similar comparative analysis, through a de-homogenising approach, on Walras's and Menger's monetary theories. Their contribution centers on methodological aspects concluding, as we do, that the Walras-Menger divide improves our understanding of the existence of a double form of modern micro- foundations for money. This paper adds more theoretical insights, proposing a rational reconstruction and evaluation of both authors through modern analytical concepts. This procedure allows us also to go back and forth from recent to XIXth century theories in order to build a complementary and productive dialogue between history of economics and economic theory.

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[4] In this line of de-homogenization, Peart (1998) has suggested that an in-depth reading of the works of Jevons and Menger can reveal important similarities in their conceptions of markets and individual behaviour. However, as it has been widely recognised (see for example Stenkula 2003), Jevons's theory of money is less developed than Menger's. Furthermore, contrary to Peart's assertions, Jevons's analysis of price formation and competition is quite close to the Walrasian distinction between the perfect competition model of pure economics and the introduction of more "realistic" conditions in his applied economics works.

The rest of the paper is organized as follows. In section 1 we first compare Walras's and Menger's pure theories of money and argue that their views on the nature of money is related with their market theory. We then contrast their price theories and how they can accommodate the integration of money. Endowed with this analytical reconstruction and evaluation of both authors, in section 2, we try to assess the recent past of the models of the modern theory of money since the middle of the XXth century until the very recent past in the XXIst century. We finally conclude.

1. Money as medium of exchange: the nature of money and its place within a market theory

Even if both Walras and Menger present money as the solution for the traditional lack of double coincidence of wants, the way they approach its role as a medium of exchange differs because their conception both of money and markets differ and they set different goals to each. In this section we analyze these differences.

1.1. The problem of double-coincidence

Walras's theory of money changes a lot between the 5th editions of his *Éléments d'économie politique pure* (hereafter EEPP)[5]. In the final version of his pure theory of money Walras explicitly deals with the actual exchange process and the difficulties of direct barter exchange. This treatment had to wait until the final version because, on the one hand, Walras never changed the main goal of his theory of money (i.e. showing the conditions that guarantee the stability of the value of money[6]), and, on the other, he frequently expressed doubts concerning the introduction of the actual exchange process within pure economics. Indeed, up to his *Théorie de la monnaie* (Walras 1992 [1898]), including the second and third editions of the EEPP, Walras considered monetary exchange as a practical simplification and a theoretical difficulty (Walras 1988: 540, 541), and left it outside his theory.

The treatment of money found in Menger differs radically from Walras´s three first editions of the EEPP. He deals with monetary exchange right from the start of his analysis and monetary theory has to solve the paradox of the generalized use of an object that has no direct utility for certain individuals (1892:239). In order to do this, Menger sustains the theory of money must provide an abstract theoretical explanation of the way in which individuals pursuing their own interest, without any legal obligation and without a view of the general interest, transform a barter economy into a monetary economy.

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[5] For a detailed discussion of the evolution of Walras's monetary theory since the first edition of the *EEPP* up to its final form presented in the fourth edition of this work see Marget (1931 and 1935), Bridel (1997) and Rebeyrol (1999).
[6] Arena & Gloria-Palermo (2004) connect Walras's goal to his conception of social justice: "Walras's approach does not confine itself to plain explanation of monetary exchanges. It also tries to establish the conditions that allow defining a monetary system in accordance with the ideal of justice" (p. 10).

In Walras's pure economics we have to wait until lesson 29 and onwards of the fourth and fifth editions of EEPP to find an explicit analysis of the exchange process. Up to these editions and lessons there is a gradual incorporation of the subject: In the first (1874) edition of EEPP Walras's theory of money was limited to the formulation of a simple exchange equation (similar to Fisher's): "*la circulation à desservir*". In sight of Menger's definition of monetary theory this could be hardly considered as anything near to a theory of money. This is even clearer if we notice that Walras says nothing in this first edition about the individual decisions concerning money demand. This kind of considerations begin to appear in the second (1889) and third (1896) editions of EEPP where Walras introduces a demand for a cash-balance (*encaisse-désirée*) equation. It still differs from Menger's theory of money but shows that there is a point of convergence between them because Walras considers that money may be mainly thought of as a medium of exchange and not as a store of value.

Up to the third edition of EEPP, the theoretical *tâtonnement* process that leads to the formation of equilibrium prices of consumption goods, capital and land takes place without any actual exchange. *Tâtonnement* is made on *bons* expressing only the desired actions of agents. In fact, in the first 28 lessons of the fourth and fifth editions, the main results take the form of existence theorems without any description of the passage from initial to final allocations. Contrary to the tradition following the Arrow-Debreu model, Walras does not replace the exchange process by any centralized device taking the form of a clearing house or an active auctioneer delivering final allocations.

From lesson 29 of the fourth and fifth editions onwards, Walras's analysis comes closer to Menger's. Walras supposes money takes its value from the difficulties of exchanges and not from the direct utility it can provide as an element of social wealth: money provides an availability service. To rationalize this concept, Walras sets an environment in which agents face a problem of double coincidence of wants due to a lack of synchronization between the moment in which they are paid and the one in which they want to spend. Money is the instrument that allows agents to separate these two moments. The exchange problem Walras describes implicitly seems to take place in bilateral exchanges. Walras refers to a double-coincidence problem due to the specialization in consumption and production resulting from the division of labor. In the second edition of EEPP Walras suggests a problem of immediate lack of double coincidence of wants:

En effet, nous vendons nos services à des entrepreneurs qui ne fabriquent pas les produits dont nous avons besoin, et nous achetons des produits à des entrepreneurs que n'emploient pas nos services. D'où la nécessité d'un intermédiaire des échanges. (Walras 1988 : 442).

If exchanges take place at equilibrium prices agents always fulfill their overall budget constraint at the end of the exchange process. However, if there is a double-coincidence problem and

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exchanges take place in a sequential manner and through direct bilateral barter, as Ostroy & Starr (1974) suggest, agents cannot fulfill a condition of *quid pro quo* in every exchange. Only an indirect exchange can allow agents not having a double coincidence to exchange. This means that it is impossible to balance the equilibrium value of purchase and sale at every trading opportunity.

However, the *quid pro quo* constraint is not imposed on all possible forms of exchange. In fact, Walras introduces an asymmetric treatment between the different types of exchange. Entrepreneurs can buy the productive services from owners-consumers without an immediate payment (Walras 1988: 443). These exchanges do not necessarily verify an instantaneous *quid pro quo* constraint, even if agents fulfil their overall budget constraint at the end of the exchange period. Conversely, in order to buy final goods, every agent must transfer instantaneously money (or goods) to the seller (*Ibid.* 441). This asymmetric treatment of exchanges implies that Walras introduces different forms of constraint according to the type of transaction.

This leads to a provisional conclusion: the main problem of direct barter Walras introduces in his monetary theory concerns the absence of double coincidence; the desynchronised character of deliveries and payments is a particular source of the general problem. The specialised character of market society precludes the feasibility of a generalised direct barter process. Moreover, Walras imposes a solution to the double coincidence problem through a particular form of cash-in-advance constraint on some exchanges but not on the others. The demand for money is explained by the existence of those constrained agents that create the conditions for the acceptability of money. And entrepreneurs accept money in order to pay productive services and capital goods. The determination of the price of the monetary service is similar to the one used for the service of a capital good. This reflects an important tension between money as a medium of exchange and as store of value. As we shall show below, Walras does not solve this tension. This explains why the neo-walrasian attempts to integrate money into their value theory leave Walras's analysis of the exchange process aside and focus on money as a store of value (the Hicks-Patinkin tradition).

Regarding the problem of double coincidence of wants Menger tackles the problem of the nature of money through an evolutionary theory of the origin of a medium of exchanges. He states that the economic organization that precedes a monetary economy is a society where market exchanges are possible but limited. In this primitive barter society traders are interested only in the goods' consumption value. The only situations that support bilateral exchange are those in which there is a double coincidence of wants. The problem that needs to be solved then has nothing to do with the meeting technology[7] but rather with the possibility of finding a counterpart for this bilateral exchange[8]:

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[7] "As a rule, the commodities offered on barter market (…) tend to be arranged so expediently that every market participant will just as easily find those who are offering the commodities that he wants as he can easily be sought out

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The difficulties hindering the development of barter (...) really lie (...) in the fact that (...) it is therefore anything but easy for a person offering a commodity to find another market participant who is offering the commodity he is looking for and at the same time wants the commodity he is offering". (Menger, 2002:27-28).

However, whereas Walras is pointing to a lack of synchronization in time, Menger points to a matching problem. Menger's approach to the double-coincidence problem features it as a search problem where agents have difficulty finding the appropriate trading partner. This is not the approach Walras takes. As stated in paragraph 274 of the fourth edition of EEPP: exchange is not a time consuming process. Agents are indifferent to exchange between the various sub-periods of the period of exchanges, i.e. the discount rate within this period is nil[9]. This precludes the aspect of the double-coincidence problem Menger underlines, which nowadays is associated with modern search frictions. The frictions at work in Walras are not related to the difficulties of carrying out transactions but mainly to the payments difficulties explained by the institutional environment. Hence, though both authors present money as a medium of exchange, they attach different origins to the need for this medium.

1.2. Individual exchange strategies vs. market equilibrium

Beyond this first almost evident divergence, a main difference between both authors lies in the decisional space agents are allowed to consider. Money in Walras pre-exists agents. On the contrary, in Menger, at least some agents can influence the choice of a medium of exchange, either directly or through the impact of their arbitrages on prices. This is not possible in Walras's theory because the definition of equilibrium eliminates any arbitrage opportunities left on the markets. Therefore, and contrary to Menger's approach, the demand for money does not result from an application of the theory of individual choice. Walras's monetary theory appears, as noticed above, as a rational justification of the existence of some cash-in-advance constraint. Though some agents choose, the others are constrained to accept money because of the characteristics of the payment system. A rule enforces money: money buys goods but goods do not buy goods.

On the contrary, Menger, making use of his subjective methodology, strives at showing that the mere existence of individual choices between alternative ways of transacting explains the transition from barter to a monetary economy and that the conditions for the latter are already

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and found by those who want the commodities he is offering: therefore, the essential difficulty with barter is not the meeting of the contracting parties" (Menger, 2002:27).

[8] This corresponds to the description of an economy in which there is a latent need for media of exchange. For Menger, this need will be fulfilled when people discover the use of indirect exchanges, i.e. when they learn the difference in the saleability of goods.

[9] Contrary to what Rebeyrol (1999: chapter 6) seems to assert the time discount rate is positive only when comparing two periods, as is the case in Walras's capital theory.

present in the former. Even if the commodities are always the same and if the number of agents is constant, an economy where agents only make direct exchanges can be transformed into a monetary economy because commodities already have the necessary properties; the only thing lacking is a transformation of individual decisions.

Menger explains the emergence of a monetary economy through a discovery process: agents, seeking only their personal interest, have limited information about the properties of objects. In particular, they ignore the most important economic property of an object, that is, its saleability. They only know which characteristics of objects satisfy their needs, which makes them economic goods but also commodities because they are traded. But in the course of their exchanges, agents realize that commodities have different saleabilities, and that the use of a medium of exchange is the cheapest way to acquire their consumption good. Hence once the profit derived from indirect exchange is discovered, people compare the available strategies and come to the conclusion that the difficulties of exchanges make the indirect strategy more profitable than the direct one.

In Menger agents not only learn what the market characteristics of the goods are, but through their actions and arbitrages they determine the degree of saleability of the goods. The discovery of the superiority of a commodity in terms of saleability does not always imply that all goods used as medium of exchange are money[10]. He proposes a distinction between money(s) and other media of exchange, i.e. whether the good is mostly consumed or used in circulation:

As long as only a part of the population of a country uses media of exchange, while the other, as a rule the more numerous, part of the population uses the media of exchange (…) only as favorite consumption goods, the media of exchange of the country in question are still so underdeveloped that it may seem doubtful whether they may be called money yet. (…) One may speak of money in the sense of the generally used intermediary of exchange only when (…) the media of exchange quite regularly do not go into consumption but circulate. (Menger, 2002:90, footnote 10).

This distinction raises the issue of the process through which a commodity becomes the unique circulating money of the economy. According to Menger, this process is social, or to use Stenkula's (2003) words, it is explained by a "network" effect. The use of a good as money "causes its acceptability to differ increasingly from that of all other commodities" (Menger, 2002: 34)[11]. The creation of money is a social product because the discovering by agents of the greater saleability

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[10] Interestingly, Menger's assumptions on how exchanges are made on the market closely parallels the "frictions" assumed in search monetary models which result in the uniqueness of the medium of exchange. These models have shown that even in an economy with three goods market transactions - when agents are rational - do not generally lead to the election of just one good as money (see e.g. Kiyotaki & Wright, 1989).

[11] Even if this view shows an important link between Menger and monetary search models, in the latter this network effect does not preclude the emergence of many goods as money, defined as in Menger's quote. The additional ingredient needed to find Menger's theory of the circulation of a unique money consists in particular assumptions on agents' behaviour and interactions

of certain commodities results from some individuals having a special role in the coordination of agents on the use of this commodity as money in a context of unequal distribution of 'economic' knowledge among individuals:

… it is also clear that nothing may have been so favourable to the genesis of a medium of exchange as the acceptance, on the part of the most discerning and capable economic subjects, for their own economic gain, and over a considerable period of time, of eminently saleable goods in preference to all others. (Menger 1892: 249)

It is the existence of this subset of enlightened individuals that allow this discovery. Their position and their market experience allow them to find new ways to obtain certain commodities that they could not get with their own. Their role, together with the assumption that other agents imitate this strategy, are key in shaping the evolutionary process that, according to Menger explain how agents converge on using a unique commodity money [12].

That some agents play a distinct role in the circulation of money is not alien to Walras. In Walras's monetary theory, it is the entrepreneurs who are given a special role by the nature of their activity. There is no cash-in-advance constraint that binds them to hold money to pay for productive services that workers, capitalists and landowners supply (Walras 1988: 441-2). Those are paid at the end of the trading period using the product of their sales. Though, this does not imply that entrepreneurs do not demand any money since they need some to buy raw materials (which are final products and not productive services). This is one of the *raison d'être* of the circulation of money.

Walras's focus on equilibrium situations keeps him from paying attention to an evolutionary process. He looks at a stationary situation where preferences and production technologies are unchanged and the amount of capital is given. He moreover restricts his analysis to economies in which the institutions governing exchanges are taken as given. Walras's interest lies mainly on public policy and on the institutional constraints imposed on a market economy. The explanation of the emergence of an institutional constraint is beyond the goal of his theoretical framework. In the same fashion (and with the same lack of justification) Walras assumed that markets are competitive, he considered the use of money as part of the environment.

Walras's theory of money and prices is dichotomous. During a first stage, a set of perfectly organized markets allow the confrontation of demand and supply to determine the vector of equilibrium prices. In a second stage, no clearing-house is assumed and money has to solve the problems linked to the allocation of goods in a decentralised context. Two interpretations can be given to this dichotomy. On the one hand, the integration of money can be seen as an extension of

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[12] For a discussion of the modern interpretations of the evolutionary process of Menger's monetary theory see Gravelle (1996), Klein & Selgin (2000), Stenkula (2003) and Álvarez (2004).

his value theory to an object called money, without incidence on price theory. On the other hand, money can be seen as a necessary condition for the realisation of the general equilibrium allocation. With the important exception of Rebeyrol (1998 and 1999), the latter interpretation has been rarely adopted though it explains why Walras's pure monetary theory was considerably modified through the different editions of his *Elements d'économie politique pure* (Walras 1988). In contrast, Menger chose not to separate the determination of prices and exchanges. Both occur at the same time, when people trade.

The Walrasian model is stated within a discrete time framework and this circulation process takes place during a unique logical period, whose length is not fixed. Walras deals with a logical and not a historical period of exchanges: all transactions are completed before another round of price setting occurs. Walras's construction implies that all goods have the same saleability since the existence of equilibrium prices ensures that the aggregate demand is equal to the aggregate supply. This stands in sharp contrast with Menger's views who disregards equilibrium situations as unrealistic (Menger, 1892:242-43).

In Walras, the price of money as an availability service is adjusted during the first stage, along with the prices of the other goods. This adjustment implies a *tâtonnement* process that "should not seriously affect" the equilibrium on other markets. In other words, Walras assumes that the introduction of money is neutral; it does not influence the relative prices of the other goods. This loose remark leads Patinkin (1948) to accuse Walras of introducing the so-called 'invalid dichotomy' and of advancing further the neutrality of money. However, as Collard (1966) has shown, Walras's claim implies rather the exogeneity of the demand for service of availability of money[13]. Be this as it may, it is important to note that Walras concludes that the equilibrium of the monetary system exists. Money, being a particular form of circulating capital, it is enough to accept the coherence of the capitalisation model (section V of the *EEPP*, fifth edition) to ensure that the monetary model has a solution in which the demand for money is positive.

Menger's price theory is closer to a tradition that goes back at least to Aristotle and developed by authors like Turgot, and, in some aspects, early marginalist authors like Dupuit, Jevons and Edgeworth (Béraud 2000). This tradition studies price formations as the result of a bilateral bargaining process over a surplus of exchange taking place in different types of markets differentiated by the degree of competition or the level of participation, information and freedom of entry. All those aspects define the perfect competition situation as a limit case, and thus a competitive equilibrium price vector, as a particular case of a more general view of price formation. In Menger's case, his price theory leads to consider different degrees of organization of

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[13] This also suggests that the Walrasian demand for money is founded on different grounds regarding the real part of the economy.

markets from a pure bilateral exchange up to the determination of what he names an *economic price*: resulting from a well organized market or the most competitive situation. Those economic prices moreover are characterized by the fact that no profitable arbitrage opportunity is left on the market.

Even if it is well established that Menger's price theory differs from the neo-walrasian tradition, the correct interpretation of his originality is still controversial. For our purpose, it is important to underline two main characteristics of Menger's ideas that he underlined in his letters to Walras. First, his rejection of an equilibrium approach à la Walras means that price theory is not focused on the existence of general market clearing but on the process of constant movement of prices. Second, Menger's conceived market prices as the result of two aspects: interactions among agents (with their respective subjective valuation of goods) and the level of development of competition. The former relates prices with subjective values of goods; the latter being defined as the level of technological and institutional organization of markets.

Menger's theory of price determination considers markets as places that include strategic interactions mediated by different degrees of market organisation. As other institutions, money contributes to improve competition as it allows a greater degree of organisation. Using Menger's ideas on price formation, this means that during the process of the emergence of money the setting of prices gradually moves from a bilateral and disorganized exchange process to an organised multilateral exchange mechanism. This implies that the bid-ask spread mentioned in Menger's monetary theory is influenced by the level of organisation of the market. A larger bid-ask spread corresponds to bilateral and irregular encounters, and the spread decreases in a better organised and multilateral environment with more frequent meetings. This implies a degree of complexity modern theory has still not reached, though it does not imply that the bilateral bargaining model, used in some models, is inconsistent with Menger's price theory.

Hence, although for both authors, the use of money as a medium of exchange comes from the absence of a double coincidence of wants, the existence of indirect exchange in Menger has very different consequences. Menger's monetary theory is a theory of the evolution of institutions and markets that combined with agents' actions determine jointly the choice of money and prices of goods. Walras, in contrast, separates the institutional environment from the trading process. Individual actions do not influence which money is used. The assumptions of perfect competition and the non strategic character of his model of price formation shaped Walras's monetary theory. The institutional assumptions introduced in the theory of money have no ground in what constitutes the fundamentals of a Walrasian economy (i.e. preferences, technology and initial endowments). But a cautious assessment of Walras's theory should also acknowledge that the same can be said of the assumption of perfect competition. Neither results from agents' individual choices, and one might wonder whether Walras's construction holds if agents were to contest the

institutions assumed in his model, i.e. to check whether money might be essential. On this ground lies the main divide between the neo-Walrasian and the neo-Mengerian approaches to pure monetary theory.

1.3. The essentiality of money vs. the integration of money

The evolution of pure monetary theory by the end of the XXth century, led to the establishment of a criterion defining whether money is essential in an economy described by a theoretical model. This key criterion of modern monetary theory translates into two requirements: first, money is needed to achieve economic outcomes that cannot be attained otherwise (e.g. barter or a system of private debts). Second, those allocations are preferred by agents (and thus implementable in a decentralised context) if they improve their welfare compared to other trading technologies[14]. This criterion does not dismiss other non-economic theories of why people use money. It simply posits that a good description of an economy in which agents maximize profit or utility includes money as a way to improve the situation of agents, compared to alternative transaction technologies (Wallace, 2002). In a nutshell, the use of money must be robust to agents being free to use e.g. pure credit as a payment mechanism. This section uses a modern *essentialist* perspective to assess the coherence of Menger's and Walras's monetary theory. Given that they both aimed at proposing an economic theory of money, we show the conditions under which they succeed.

Menger's spontaneous-order approach involves a consideration about whether an original situation of disorganised bilateral barter may evolve into a more developed monetary economy. More developed meaning a better global situation. This description then seems to imply that the use of money improves the efficiency of the economy. But the very process through which the selection occurs could make the distribution of those gains unequal, and thus could make agents worse off than in an alternative scenario. In Menger, the enlightened individuals select the monetary object and they are able to make the other agents use this object as money. Furthermore, a monetized exchange economy creates the individual incentives necessary to avoid a return to a barter situation. Hence, this implies a transformation of the economy and maybe a transformation on its fundamentals, making it difficult for the modern comparative static analysis to be conclusive about the effects on individual welfare. But there is nothing straightforward in considering that the fact that one subset of the agents chose gold as money guarantee that this improves the situation of every agent. Menger's assumption about the enlightened individuals

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[14] See Kochelakota (1998), Wallace (2000) for the original formulation of this criterion and Araujo & Camargo (2010) for a recent discussion on *essentiality* of money within credit economies.

potentially uncovers redistribution issues of the gain derived from the emergence of money that cannot be assessed through the essentiality criterion[15].

Let us now see the conditions under which an *essentialist* analysis of money may be reconciled with Walras's perfect competition framework. One alternative to money in Walras is a system of pure credit. Following Brunner & Meltzer (1971: p.785):

If there is no costs of acquiring information, differences in the timing of receipts and payments are adjusted by issuing verbal promises in exchanges for goods and, later, delivering goods ... It is easy to see why 'lack of synchronisation' does not imply that money is used and held.

To see this, consider the case in which there is no requirement in terms of *quid pro quo* in every exchange. This means that on Monday an agent will issue some debts (thereafter IOU), at the equilibrium prices, in order to realise all exchanges. These IOU will be redeemable later, at the *pre-determined* moment of delivery of the agents' production. At the end of the week, and given the situation of general equilibrium, agents obtain their final allocations and all IOU are redeemed. In this situation, each trade is not balanced at a particular point in time although there is an overall balancing. Here the decentralised credit system may replicate the function of money. If a strict *quid pro quo* is not imposed, agents can choose to be paid with goods, money or through some credit arrangement. Given the difficulties associated with barter, one may conclude that there are situations in which agents are indifferent between credit and money although they prefer them to barter. Hence, to prove that agents are interested in using money, one has to show that agents do not prefer to arrange their transactions through personal booking of individual debts rather than through money or barter. This implies establishing the conditions under which such a credit system works.

Some recent works in the search theoretic approach to money can illustrate this point. Kocherlakota (1998) shows that what makes money essential is the existence of some type of double-coincidence of wants, some imperfect enforcement and anonymity. Subsequent works demonstrate that a necessary condition for agents to prefer money over debt is the existence of some imperfect knowledge of individual histories and anonymity (Nosal & Rocheteau, 2010). Indeed those two features make pure credit a fragile situation as they increase the difficulties and costs of being repaid. They then lower the return on the use of credit as a payment system. Following this approach, it is possible to check if money is essential in Walras studying whether his price theory can accommodate some imperfect knowledge of individual histories and agents' anonymity.

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[15] Menger is perfectly clear about the role of the public authorities in the consolidation of a stable unit of account and on the quality of the monetary object (Menger 2002 [1909]: p. 98 onwards)

Walras acknowledges the actual possibility of other exchange technologies instead of money. He uses practical arguments in order to justify that *metallic money* is the most liquid of all media of payment. Even if his theoretical model supposes that exchanges take place at equilibrium prices and that there is no uncertainty[16], Walras states that private means of payment are necessarily less liquid than money. But when stating this "fact" (*constat*), Walras resorted to the traditional metallist argument extending his theory of fiat-money to a theory of metal-money (Lesson 32nd):

Nous ne jugeons pas le fait ; nous le constatons et le précisons. En raison de leurs qualités exceptionnelles, l'or et l'argent sont de la richesse liquide. On peut les enfouir ou les déposer en lieu sûr avec la certitude qu'ils auront toujours leur valeur, et cela d'autant plus que les circonstances seront plus critiques. Des capitaux fixes ou circulants ne valent qu'en raison de la valeur de leur service ou de leur usage qui peut être nulle ou le devenir dans bien des cas. Donc les échanges réglés en titres ne sont pas liquidés. (Walras 1988: 521)

The fact that Walras considers the coexistence of credit and money seems to indicate that his model includes imperfect monitoring. Walras is too vague on this to allow checking whether this assumption does not contradict those necessary to obtain the competitive price result. Recent theoretical advances may however help as a guide to learn about the conditions under which there is no contradiction. Lagos & Wright (2005) and Rocheteau & Wright (2005) seem to support the conclusion that the Walrasian model is coherent. Both articles show that trades can occur on centralized and perfectly competitive markets with a fiat money circulating in the economy. They argue that the pricing under perfect competition does neither require the knowledge – by the auctioneer – of the agents' identity (i.e. that the demand and supply sent by agents cannot be identified) nor does it suppose a perfect enforcement mechanism. They conclude that such a competitive price mechanism is coherent with money being essential. Though this point of view was challenged by Araujo , Camargo, Minetti & Puzzello (2010), it may well be that Walras's construction can feature both the circulation of money and a centralized competitive pricing scheme.

2. Contemporary monetary theory

Now that we have contrasted Walras's and Menger's monetary theories we have a new reading grid to disentangle contemporary monetary theory. This grid helps assessing its development during the XXth century as a change from a neo-walrasian to a neo-mengerian framework. This change can be explained because of the inability of the former framework to solve what Hellwig in 1993 summarized as the basic questions of monetary theory. This change leads to the construction of a unified framework for the study of monetary questions (as claimed in the title of the Lagos &

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[16] « Une légère incertitude à cet égard ne peut provenir que de la difficulté de prévoir les changements possibles dans les donnés du problème. En supposant ces données invariables pendant une certaine période de temps, et en supposant les prix des produits et des services, et leurs dates d'achat et de vente, connus pour toute cette période, nous ne laissons place à aucune incertitude. » (Walras 1988 : 443-445)

Wright 2005 paper). A distinction is however noteworthy. As underlined by Williamson & Wright (2010), the changes occurred mainly in terms of methodology and of the logical requirements that formal models must obey. It is especially on this dimension that monetary theory becomes neo-mengerian. The history of the so-called -and less and less pertinently called as we shall see- search theoretic approach to money helps revisit the monetary issues both authors raise.

2.1. Money in Neo-Walrasian Equilibrium Models

The publication of Patinkin's work between 1948 and 1956 profoundly impacted the path of monetary theory. The aim of those papers was to propose a new incorporation of money into the Walrasian price theory. Rather than introducing a distinction between various classes of agents as Walras did, this scholar introduced money as one of the arguments in the utility function. He therefore thought he had explained a positive demand in equilibrium for this good[17], that he further used to show the situations in which a change in the quantity of money impacted relative prices (is non-neutral). But contrary to what Walras did, he put money and goods on the same footing. This reinterpretation of the Walrasian monetary theory was heavily discussed. Critics have argued that it suffered from two main shortcomings:

- First, as Hahn (1965) pointed, the "(in)essentiality" of money in Patinkin's formulation of Walras's monetary theory[18]. This author considers nothing guarantees the use of money as a medium of exchange in the model because it also admits a non-monetary equilibrium, i.e. an equilibrium in which agents exchange without money[19]. Hahn suggests that monetary theory cannot be dissociated from an explicit analysis of decentralised exchange mechanisms that incorporate explicitly some elements of transaction costs to guarantee the use of money. Hahn's criticism is akin to both the Mengerian view and the recent theoretical approach to money that require spelling out explicitly the assumptions on the trading environment necessary to make the use of money by agents incentive-compatible.
- Second, admitting the positive price of money in Patinkin's model, the sole existence of a budget constraint does not imply anything about the kind of good used as a medium of exchange (Clower, 1967). Moreover, following Marschak (1949), there is no need for a special object called money as every agent knows that prices are market-clearing prices so each good has the same liquidity and all goods are "money" when used in payments.

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[17] This reconstruction begun in 1948 with the publication of "Relative Prices, Say's Law, and the Demand for Money" and ended in 1956 with the first edition of "Money, Interest and Prices: An Integration of Monetary and Value Theory".

[18] However, it is important to notice that Walras's monetary theory was already far from Patinkin's reconstruction. Contrary to Patinkin, Walras gradually constructed a monetary theory whose main goal was to explain the role played by money in exchange, whereas Patinkin and his critics concentrated on the store of value problem. Thus Walras was a step further in the history of monetary theory when we compare him to Patinkin. In fact, as we saw in the first part of the document, the analysis of the difficulties of the exchange process leads Walras to anticipate a form of Clower's cash-in-advance constraint.

[19] Technically, this comes from the use of the fixed point theorem and the presence of free goods.

According to Clower, this contradicts the characteristics of exchanges in actual economies in which "Money buys goods, goods buy money. But goods do not buy goods in any organised market" (1967: 6)[20].

Therefore, it was acknowledged that there was no proof of the existence of a monetary equilibrium in Patinkin's model. Scholars struggled in various ways to overcome these two shortcomings. According to Johnson (1974:215), two types of solution were adopted. Some searched for a practical solution to the theoretical problem, in order to continue the traditional debate on the neutrality of money between Keynesian and Neo-classical economists. Others identified the problem as conceptual and followed Hahn's suggestion of dealing explicitly with the role of money as a medium of exchange in a decentralised economy[21]. This renewal of researches on the interplay between money and transaction costs, paved the way to a come back of the study of the conditions under which agents come to use an intermediary of exchange, clearly a Mengerian isssue.

The first strand of research pursued the Walrasian goal on the neutrality of money without detailed description of the exchange environment. To this end, researchers substituted to the money-in-the-utility-function approach a new approach, which took Clower's suggestion at face value. A new constraint was added, on top of the budget constraint, into the agent's maximisation program. This is the well-known "Cash-in-Advance" constraint according to which each agent is required to hold, before performing any trade, all the money it will have to spend. This innovation further re-invigorated the traditional macro-economic debate on the neutrality of money through the incorporation of parts of the micro-economics of labour and product markets.

At the same time, another strand of researches, labelled as the pure theory of money[22], emerged with the aim of understanding the role of money in transactions. Those attempts shared the belief that monetary theory had to enter into the black-box of exchange technologies and to model the "motives for holding money" (Brunner & Meltzer 1971: 784). This was done by dropping the centralised nature of exchanges assumed by Debreu (1959:28) to focus on economies in which there is no room for a clearing house or any centralised algorithm to allocate goods[23]:

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[20] A point that distinguishes the Neo-walrasian from the original Walrasian framework is that the former drops the distinction between entrepreneurs and workers.

[21] As Johnson stated: "Only in the past five years or so have economic theorists begun to attempt to explain the presence of money in economic terms, and to work out the implications both for monetary theory and value theory" (1974:215).

[22] The most important are: Brunner and Meltzer (1971), Ostroy & Starr (1974), Jones (1976) and Niehans (1978).

[23] The following quote, from Fischer (1974:158) summarised the common opinion among monetary theorists: "There is no role for money in macro models which are all small Walrasian general equilibrium models. Essentially, it is argued that there is no role for money in intertemporal general equilibrium models since all trades in such models can be arranged in the first period the auctioneer opens the market; alternatively, within each trading period, there is no obvious need for a medium of exchange since all trade takes place within the market at equilibrium prices". Those small

One branch of the literature is concerned with the feasibility of attaining a competitive allocation of goods in a decentralised context. (...) The other branch of the monetary exchange literature focused on trading costs as determinants of optimal and equilibrium patterns of exchanges. (Brunner & Meltzer: 758-759)

The goal pursued by monetary theory became the search for explanations of why money is *essential*: why monetary exchange allows attaining final equilibrium allocations which are not possible under a different decentralised exchange technology. A major difference between the papers published in the 1970s is however the role granted to the Walrasian theory of competitive markets. Indeed Jones (1976) classified those early attempts between two different branches: The first branch tried to reconcile monetary theory with Walras' value theory (Ostroy & Starr, 1974) by assigning each a distinct role: value theory offers a theory of price determination while monetary theory is part of a theory of the institutions economic agents use to implement the competitive equilibrium. More precisely, money is one of the mechanisms allowing the decentralisation of equilibrium allocations[24] in which "an economic arrangement is generally described as decentralised if it involves individual agents making decisions based on a fairly small body of universally communicated information (e.g. prices) and on information which the agents themselves may be supposed to possess (e.g. individual tastes and endowments and, in this case, the pair's trading history)" (Starr 1972: 1097). With this definition of decentralisation, monetary theory is only a particular branch of the theory of how people trade. And the methodology consists in comparing the efficiency of money versus, e.g., barter. Thus, although the price theory is still Walrasian, the work of Ostroy & Starr incorporates an important element of Menger's conceptual framework[25].

Ostroy and Starr's comparison between trading mechanisms appeared however non-granted to authors influenced by Menger's work. As Jones (1976) puts it: "[these works] offer no suggestion for how a monetary pattern could evolve without a centralised decision" (759). Hence, although money improves agent's welfare, it is still possible that – provided this choice is allowed – they may not choose to use money to carry out trades. Indeed nothing proves in Ostroy and Starr's framework that the pattern of exchanges postulated is the result of the strategic behaviour of agents. Nor is there a justification of why agents do not use the information they get from the

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Walrasian models, that follow Debreu's modeling, are not explicit about the frictions that explain trade. This is akin to Williamson and Wright's (2010) criticism of non-microfounded models of money.

[24] More precisely, Ostroy and Starr (1974) assume that "the Walrasian auctioneer announces equilibrium prices but leaves the expedition of trades to the individuals themselves" (1094). Following Starr (1972: 1095), the exchange process takes place in a disorganised manner following a series of bilateral meetings.

[25] The authors showed that barter is inefficient because it implies that agents demand goods not only for consumption but also as a mean of payment for indirect trades. This results from the fact that nothing guarantees that one agent will not block the realization of other exchanges when it acquires a good it does not want to consume. This can delay the achievement of equilibrium allocations between traders. Conversely, the use of money, defined as an asymmetric good (i.e. its demand only depends upon its function as medium of exchange and nobody demands it for consumption), is an efficient way to guarantee "the full execution [of a given redistribution of goods] in a limited number of trades" (Ostroy and Starr, 1974: 1111).

exchange process in order to have more than what was assigned to them by the Walrasian auctioneer. In other words: Agents can not only decide to trade, they may also decide to adhere – or to alter – to the institutions governing trades[26]. With Jones' remark, another key Mengerian intuition was incorporated into monetary theory. He insisted that the implementation of economic choice theory in the monetary phenomenon implied taking into account agents' strategic behaviours. Following this idea, Jones turned to Carl Menger's monetary works, because as he acknowledges (cf. 1976) "The evolutionary process we wish to capture … closely parallels the process envisaged by Menger (1892)…" (766).

Taken together, those papers contributed to the construction of theoretical criteria to build a new – neo-Mengerian – framework to deal with monetary issues. With these changes in the formal requirements of theoretical monetary models, researches headed for the explanation of Menger's "paradox" (Clower, 1977:206), which became a theory explaining how agents come to exchange with money when there is nothing to "specify which objects will play a special role in trade" (Wallace, 2000)[27]. The history of the monetary theory up to the beginning of the 2000s incorporated many refinements of this Neo-mengerian framework. For a while, monetary theory became an autonomous field of research, independent from Walrasian price theory. It is however unclear whether this decision was consciously made or whether it was only a way to economise on technical problems[28]. However, according to Cartelier (2001: 994-5), this quest solved most of the basic questions of monetary theory as Hellwig summed them up in 1993[29].

2.2. Search monetary theory: rediscovering Menger before coming back to Walras

The incorporation of Mengerian issues into monetary theory was completed with the application of the search-theoretic approach to money. Even if these models do not succeed in replicating all of Menger's conclusions, the search-theoretic approach has to be considered as an attempt to deal with the issues this author raised. Even if some aspects of Menger's theory are not part of this approach[30], a large number of both Menger's issues and Menger's basic elements of a theory of market and money are dealt with. A pre-requisite of both Menger and the search theoretical approach is indeed the full and detailed description of the environment in which people trade. Both consider situations in which agents obviously need to overcome difficulties experienced while trading and the use of a medium of exchange solves or reduces those difficulties. Moreover,

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[26] See Cartelier (2001) for an assessment of the feasibility of this task.

[27] The Menger's paradox is usually summarises as an answer to the question of why someone should be ready to exchange his goods against little metal disks apparently useless." (Menger 1892:239, 2002:26).

[28] As recent monetary search models suggest (see e.g. Lagos & Wright, 2005).

[29] This statement is however still discussed.

[30] Notably his subjective methodology (cf. Schmitz, 2002) but also the fact that those models never focused on a central element of Menger's theory of the emergence: the role of the spread between the bid and the ask prices in revealing goods' saleableness and therefore in selecting the media.

the competition between various exchange technologies (e.g. barter and money) or various means of exchanges and payment (commodities, fiat money, capital) is a recurrent theme in recent models[31].

Menger's conjecture on the origin of money as a *spontaneous order* institution is very close to the characteristics of a monetary Nash equilibrium in a search monetary model. In fact, a search monetary equilibrium describes a situation where nobody wants to change his/her trading strategy given others' exchange strategies. Furthermore, under this situation the economy supports allocations of resources that are impossible to achieve under a barter situation. Strategic interactions and essentiality are significant characteristics of the Mengerian approach to money and the search theoretical models nowadays. Nevertheless, the evolutionary process Menger describes has not been fully integrated within modern search monetary theory (see Álvarez (2001 and 2004)). In these models, the link between each individual and the collective behaviour of the population is given by the assumption that there is a correspondence between individual behaviours and the average behaviour of the population. This decision rule can be interpreted as an incentive compatible constraint but in no case does it tell us something on the emergence of money.

Clearly the search monetary theory is an equilibrium theory and this stands in contrast with Menger's view. This appears clearly in the assessment Kiyotaki & Wright (1989) make of Jones' (1976) work, who offered "an interesting framework in which one can examine which of many commodities will circulate as media of exchange, although his traders are somewhat naive concerning both the equilibrium matching distribution and their choices of strategies.". But it should be noted that Menger's criticism of equilibrium situations was made with particular reference to the Walrasian depiction and that he insisted on profit-maximizing individuals (though some agents mimic the others, the most successful are those that have a profit maximizing view). In search models such as Trejos & Wright (1995), agents are allowed to play strategies both on the quantity traded and the medium of exchanges used while the Walrasian model only sets prices.

Yet other elements of Menger's methodology (requirements) are taken into account by the search approach. This is the case of the insistence on bilateral exchanges and bilateral optimality. For example, the question about the essentiality of money is especially interesting when it allows to compare the outcomes of various non-cooperative solutions to the difficulty of trade[32]. Indeed it may well be that some non-cooperative solution is dominated. In early models (*à la* Kiyotaki and

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[31] Competition between fiat moneys is dealt with in Kiyotaki & Wright (1993). Renero (1999) is an interesting follow-up to the Kiyotaki & Wright (1989) paper on the issue of competition between commodity moneys. Aruoba & Wright (2003) and Lagos & Rocheteau (2008) study the competition between capital and money.

[32] In the motivation for their 1989 article, Kiyotaki and Wright clearly define the research programme set up by their approach: "The basic goal of this project is to analyze a simple general equilibrium matching model in which the objects that become media of exchanges will be determined endogenously as part of a non cooperative equilibrium" (928).

Wright, 1989 or 1993 or *à la* Trejos & Wright, 1995), exchanges are bilateral and prices are set during exchanges, through negotiation. Since the economy contains many traders, those bargained prices are such that no agent has a better outside opportunity (Trejos & Wright 1995). Yet, a key difference with Menger is that the focus on equilibrium situations entails that there is no unexploited (profitable) arbitrage opportunity in equilibrium. The situation considered is then close to Menger's notion of economic prices but it does not offer insights on how the degree of competition is transformed by the use of money. However, although this feature is not central in the most popular models, some research focused on this interaction (e.g. Howitt, 2005).

If we look in more detail at the dozen years following the publication of the article by Kiyotaki & Wright (1989), we can see that the search approach to money revisited many of the monetary issues Menger raised. Three dimensions are especially worth discussing: 1) When is an agent interested in accepting money in payment? 2) How is the monetary equilibrium selected? 3) Does the use of one money as a medium of exchanges preclude the use of another one? The first issue is linked to the solutions that the search approach gives to Menger's paradox. The second issue deals with Menger's insistence on the conditions necessary for the selection of this situation. The third issue provides new insights on Menger's distinction between money and media of exchange.

In early search models of commodity money, as in Menger, the use of a medium of exchange has nothing to do with "general convention or law, in the interest of commonweal" (Menger, 1892:240). In both cases, it is the intrinsic and/or marketable properties of the commodities that explain their selection – by a population – as moneys. In both cases, the reasons for the use of some commodities as media of exchange are various and their precise role is difficult to determine. Indeed, in search models the circulation of a commodity as money requires two conditions: 1) people are coordinated on the use of it and 2) if it is difficult to trade without money (e.g. through direct barter). Hence, in those models, a sufficiently important demand of a commodity for consumption purposes can be sufficient to coordinate the population on its use as moneys. This can be achieved even if that good has (relatively) poor intrinsic properties, as shown by Cuadras-Morato and Wright (1997), Cuadras-Morato (1997) or Renero (1999). The interest of these models is providing conditions that explain whether some particular reason is sufficient or not to make a commodity an intermediary of exchange. They are able to show that no particular intrinsic or market properties of a commodity are sufficient for it to circulate as money.

The second reason for why "every economic unit in a nation should be ready to exchange his goods for little metal disks apparently useless" (Menger, 1892:239) is, in search models, that alternatives to the monetary exchange are more difficult to use, and then more costly. Indeed in money-search models, the most severe difficulties are associated with trading using some alternative to monetary exchange, which becomes more likely because agents are ready to use indirect exchange strategies. In the Kiyotaki & Wright models (1989, 1993), the alternative

considered is direct barter, just as in Menger. They show that the lower the probability of obtaining the goods through direct barter, the more likely is a population to accept money (indirect exchanges) in order to overcome the problem of double coincidence of wants. Interestingly, as shown by Corbae, Temzelides & Wright (2003), in those models, the random matching assumption is not crucial for generating a demand for money. As in Menger (2002:27) the main problem with direct barter trade is not finding an immediate single coincidence of wants but the actual existence of a double coincidence. Williamson & Wright (1994) construct a model in which the difficulty in assessing the quality of good explains how the use of money reduces the implied adverse selection problem (an idea that dates back at least to Brunner and Meltzer, 1971, and Alchian, 1977). More recently, Kiyotaki & Moore in their article "Evil is the Root of All Moneys" argued that the main trading friction is limited commitment to repay debt (2002:62). This rationale, contrary to previous ones, can hardly be found in Menger. Money is used in this economy because it is liquid (it can be resold without doubt) while private debts are not, both because agents can break their promise to repay (moral hazard) and because of their limited re-saleability (adverse selection).

However, Menger did not consider the possibility of money in the form of a purely intrinsically worthless object such as a banknote. Using Menger's distinction between market and intrinsic properties, a major difference between this type of object and the commodities is that nobody is ready to demand it on the market. In search models, the rationale for the use of intrinsically worthless money requires the fulfilment of another condition. With fiat money, Menger's paradox is solved, provided that agents are coordinated on the acceptance of this object in trade. Assuming that the population accepts fiat money, it is possible to build an equilibrium in which everybody has an interest in accepting it. In the simplest model (Kiyotaki & Wright, 1993), the acceptance of fiat money is a Nash equilibrium and there is no explanation of why agents coordinate on the use of money except their beliefs. Some may be tempted to interpret this as a general convention, though this need not be the case. Iwai (1996) interprets this as the result of the bootstrap nature of fiat money: "If everyone expects that money will not circulate, everyone refuses it in payment and then money does not circulate". Conversely, if everybody expects money to circulate and trade frictions are severe enough, everybody accepts money in payment. This gives the fiat money model a flavour of Hahn's problem: the non-monetary equilibrium always coexists with the non-monetary equilibrium. Some later models proposed however alternative theories of how the selection of the monetary equilibrium takes place. Aiyagari and Wallace (1997) and Li and Wright (1998) show that introducing a group of non-maximising agents, committed to always accepting money in payment, makes the monetary equilibrium unique for some region of the models' parameters. The mechanism explaining this result is similar to a network effect, as in Menger (see Wright, 1995). Indeed if a sufficiently large part of the population accepts fiat money, the other part will also accept it. Bignon & Breton (2003) apply this general principle to explain the selection

of a monetary equilibrium in two different contexts. The first is based on the existence of some social norm effect on the acceptance of money by part of the population. In the other, the pre-coordination of a merchant community on the use of money makes the whole population accept it (if the merchants' trade share is big enough). It is noteworthy that these explanations do not necessarily rely on the existence of non-maximizing agents. Indeed in the second context, merchants have an interest in accepting money in the first place. Therefore, in the case of fiat money, the market characteristic of the object used as money explains its selection in equilibrium, and just as in Menger, the size of the demand for a good contributes to its monetary status.

However, just as in Menger, this property of money as a network good does not involve that using a particular object as money excludes any other candidates to the monetary status. This leaves us with the third issue we have identified: does the use of an object as money preclude the use of others? In modern monetary theory, just as in Menger, this need not be the case. In the Kiyotaki and Wright 1989 model of commodity money, there are equilibria in which two commodity moneys circulate. Moreover, in this model, the share of the population that consumes a good is at least as important as intrinsic properties like storage cost in explaining the use of a commodity as money. This can be explained as follows: the share of the population that consumes a good plays the same role in that model than the governmental agent in Aiyagari & Wallace (1997). Nothing precludes the use of two goods as commodity money as long as they are consumed by a large enough part of the population because when accepting a widely consumed good as money, the holder of that good is sure that she/he will be able to resell it quickly. And this effect dominates in general the intrinsic properties effect. Even when one turns to the fiat money model and introduces a second fiat money in it (Kiyotaki & Wright, 1993), it is easy to construct equilibria in which the two moneys are accepted. Hence, there are no general results on the number of moneys that can be accepted in an economy: The use of one object as money gives this object a natural monopoly flavour but if nothing is done to exclude competitors, other objects can also circulate as money. This is similar to the theory of legal restrictions explaining that modern monetary systems are shaped by the intervention of a public authority such as the State[33].

Though still active, the debate on the existence conditions of the monetary equilibrium is less buoyant since the beginning of the 2000's. Indeed, a difference must be made between two strands, one that continues the examination of traditional issues in monetary theory and another that uses a modified framework to explore, notably, issues linked to the neutrality of money and the optimality of the Friedman rule[34]. To this end, they introduce some elements of centralisation

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[33] It is worth noticing that this argument differs slightly from Cowen & Krozner (1993).
[34] The key shift was the publication in 2005 of the article by Lagos and Wright. Although Lagos and Wright (2005) incorporate key elements of the previous search models, they allow trade to occur on a centralized market. This model overcomes some of the limits in terms of tractability of the Trejos and Wright paper (1995) (that makes prices endogenous in the Kiyotaki & Wright (1993) model). In particular, the Trejos and Wright model suffers from two

of trades. For example, the sequence of trades includes the use by agents of two types of markets, one with prices set as in Arrow-Debreu (i.e. with centralised meeting, no double coincidence of wants problem and prices set so that the demand for each good is equal to the total supply) and another decentralised market on which trade occurs in pairs, prices are set through a bargaining process and on which it is costly to find a double coincidence of wants. This approach combines elements of centralisation on some markets with decentralised markets in the Ostroy and Starr definition (i.e. with limited information on trading opportunities). Though this construction produced a lively debate on the coherence of the assumptions implied by the coexistence of those various types of markets (see notably Aliprantis, Camera & Puzzelo, 2007 and the answer by Lagos & Wright, 2007), the model by Lagos and Wright has been often used to propose quantitative assessments of various types of monetary policy.

Clearly, the introduction of the centralisation of trades on some of the markets marks a revival of the Walrasian approach to monetary theory, i.e. that money may circulate as a medium of exchange in an economy in which markets are perfectly organized. This inflexion became more obvious in Rocheteau & Wright (2005). This article incorporates and compares three different market structures that differ notably in their price-setting mechanisms (search, competitive and competitive search) in an otherwise standard monetary model *à la* Lagos & Wright (2005)[35]. The competitive mechanism is especially interesting in light of Walras' theory of money as it constitutes a new – relative to the previous models – type of the double coincidence of wants problem. Here, the problem does not lie in the specialisation of agents in some productive activity who can only meet intermittently but in an assumed asynchrony between the various traders. The asynchrony between deliveries and payments occurs because during some logical periods some agents are assumed to be buyers while others are bound to be sellers. This parallels the asynchrony Walras describes.

The comparison – by Rocheteau & Wright (2005) – between market structures helps to separate the elements that make money essential in these models, i.e. whether this comes from the characteristics of the environment such as preferences or information – or from the assumed

drawbacks: 1) the quantity of money that each agent is allowed to hold is limited to 1 unit, and 2) money comes in indivisible units. Despite some attempts (notably Berentsen, 2002), the relaxation of these assumptions creates analytical difficulties because it is necessary to keep track of an heterogeneous distribution of money holdings. Lagos and Wright (2005) introduce two markets, one market with Arrow-Debreu prices and another, decentralised with bargained prices. The assumption that some of the arguments of the utility function have quasi-linear preferences allows to degenerate the distribution of money holdings (i.e. people carried the same amount of money in the decentralised market). They are then able to study a model with both divisible money units and unbounded monetary holdings.

[35] The search-price mechanism in their model consists of agents meeting randomly in pairs and bargaining over the price of the trade. The competitive mechanism consists in anonymous traders meeting in a large market and taking prices as given. The last market is labeled competitive search, because, as in Moen (1997), sellers post prices on one of the various submarkets in order to attract buyers. Buyers and sellers choose which submarket to visit depending both on the time it takes to trade and on the posted prices.

market structure (price setting mechanism). They then show that the circulation of money as a medium of exchange is not linked per se with the market structure, although the market structure impacts the efficiency of the trade process. The impact of this paper (which is now one of the most-cited articles in this literature) profoundly altered the path of the modern theory of money as it reconciled those models with older approaches such as overlapping generations models *à la* Wallace (1980) or turnpike models *à la* Townsend (1980).

To sum up the history of recent modern models of monetary theory, two main points are worth emphasizing in light of the long-term history of this field. First, the infancy of the search theoretic framework deepened the separation between the macro-economic debate on the neutrality of money and the analysis of the economics of the media of exchange. This period was characterized by a return to Menger's questions and concerns, and to Menger's method of comparing alternative trading mechanisms. This separation between the macro-economic debate (notably the question of the neutrality of money) and monetary theory was temporary as recent efforts in the search-theoretic literature amended substantially the original framework to allow studying the impact of a change in the quantity of money on the price level (Lagos and Wright, 2005). This change was important to drive monetary theory back to the Walras's original monetary theory, i.e. the one that emphasized that a medium of exchange solves the difficulties linked to the asynchrony between payments and deliveries on perfectly competitive market. However, a main difference between contemporary papers and Walras's approach lies in the fact that perfectly competitive markets need to be able to accommodate some degree of anonymity and imperfect enforcement for money to be essential.

3. Concluding remarks

Our paper goes beyond the attempts to translate past authors' theories in contemporary terms. We believe that the use of modern monetary theory to understand Walras and Menger shows that the differences in contemporary theory reflect the difference between these two authors. That is, Walras and Menger initiated two research programs, a Walrasian one that leads to the question about the condition under which money is neutral and a Mengerian one on the determinants of the choice of the institutions that facilitate the realisation of exchanges. This allows us to rethink the difference between the two authors and thereby to put in perspective the contemporary developments in monetary theory and to propose an interpretation of these recent advances.

Recent monetary theory through the adoption of the criterion of the *essentiality* of monetary exchange partially follows Menger's monetary theory. However, it goes beyond Menger by introducing alternatives to monetary exchanges other than barter. During the early developments, this led to adopting a framework in which the structure of exchange is completely disorganised in order to justify that money is not replaced by another exchange technology such as a credit

system. Yet the evolution of those recent models shows that they can accommodate very different market structures and assumptions about the trading process. Menger's market theory contains an interesting, but less exploited, insight on the relation between the emergence of middlemen and the necessity of monetary exchange allowing conciliating a rather well organised market with the existence of monetary exchange. However, modern monetary theory, in particular the search monetary framework, faces some difficulties when incorporating these elements.

The evolution of the French economist's writings reflects an increasing consciousness of the central place of monetary exchange within his pure economics. In this sense Walras's final monetary model converges towards a justification of money as part of the assumptions (i.e. preferences, production techniques, and initial endowments) of his model. But it is especially important to notice that on this regard, money is put on the same footing as perfect competition. Monetary exchange is thus introduced as an institutional constraint rather than as an individual choice.

This might explain why his heritage in pure monetary theory may be seen as less discernable at first sight. This can be explained by the fact that Walras's theory was often interpreted using Debreu's interpretation of the actual trade process as being realised by a clearing house. Yet the recent models build environments that are very close to Walras's idea of money as solving the asynchronies between deliveries and payments. Walras's theory is not an attempt to give microeconomic foundations to monetary exchange when judged through modern criteria. Contemporary work however shows that under some conditions, perfect competition can be reconciled with monetary exchanges. These recent works show that, contrary to Walras's assumption, and in accordance with Patinkin's idea, the introduction of money impacts negatively the efficiency of the economy and a positive inflation rate may be desirable.

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