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Léon Walras and Augustin Cournot on the Regulation of Paper Money: Rules vs. Discretion at the End of the 19th Century

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Abstract. This paper compares Léon Walras' and Augustin Cournot's views on monetary regulation. It shows that whereas Cournot believed discretionary monetary regulation to be convenient and acceptable, Walras held that the only acceptable monetary system is based exclusively on the stability of the value of money under a monetary rule following a strict equivalence between metallic reserves and a pure medium of exchange form of money. The paper also advances Cournot understood more clearly than Walras the evolution of the monetary system of their days because Walras was trying to guarantee the coherence of his pure theory with his applied theory, which made him unable to accept the evolution toward a monetary system based on fiat money.
Keywords: Paper-Money; History of Monetary Thought; Léon Walras; Augustin Cournot; Central Bank
JEL Codes: B13, B31, E58, E40

[es] Leon Walras y Augustin Cournot sobre la Regulación del Papel Moneda: Reglas versus discrecionalidad a finales del siglo XIX

Resumen. Este artículo compara las teorías de Léon Walras y Augustin Cournot sobre regulación monetaria. Demuestra que, si bien Cournot creía que era conveniente y aceptable la regulación monetaria discrecional, Walras sostuvo que el único sistema monetario aceptable es el basado en la estabilidad del valor del dinero bajo una regla monetaria que siga una estricta equivalencia entre las reservas metálicas y el dinero, considerado como puro medio de cambio. El artículo también apunta a que Cournot entendió mejor que Walras la evolución del sistema monetario de su época dado que Walras trataba de mantener la coherencia de su teoría pura con su teoría aplicada, lo que hizo que fuera incapaz de aceptar la evolución hacia un sistema monetario basado en dinero fiduciario.
Palabras clave: Papel moneda; historia del pensamiento monetario; Léon Walras; Augustin Cournot; Banco Central
Códigos JEL: B13, B31, E58, E40

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0. Introduction

The second half of the 19th century is a period of great transformations in monetary history. The crisis of metallic systems and the expansion of fiat means of payment are some of the salient events of the time. In the case of the French monetary system, the most significant facts during this time was the expansion of the Bank of France with its consequent *de facto* monopoly on note issue within the entire national territory[2] and some periods of non-convertibility. Even with an important expansion of the Bank of France's paper-money under Napoleon's First Empire, the French monetary system was behind the development of the circulation of paper-money attained by England or even by northern European countries (Cameron 1967).

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[2] In 1803 Bonaparte gives the Bank of France the monopoly of note issue for the Parisian region only. At the time there were still an important number of regional banks issuing notes, but regional paper money never acquired national circulation. This limited circulation is explained not because of a legal reason, which eliminated only the Parisian competitors of the Bank of France, but because of the regional banks' lack of "credibility" outside their own region. See (Wolowski 1864, iii) and (Davies 2002, 555-567).

Cameron (1967) attributes the backwardness of France's banking and monetary systems to "the monopolistic position of the Bank of France and in the restricted vision and inflexible attitudes of the men who controlled its destinies" (p: 127). In fact, since the consolidation of the First Empire [1804], until the instauration of the Second Empire [1852] witnessed a political and economic struggle between the pretentions of the Bank of France to consolidate its issuing monopoly in the entire national territory and the commercial bankers. In a context of the consolidation of the Industrial Revolution, and an increasing exposure to international commerce and the expansion of a desire for consolidating an economic empire, the needs for a more flexible financial system were pressing among the liberal ideologists and the bourgeoisie.

The bi-metallic system, established in France along the 19th century, required arbitrages between silver and gold, and created an active monetary market. The presence of this market developed a vigorous activity of different actors, including commercial banks and the Bank of France, and led to an increasing debate about the necessity to liberate the creation of more sophisticated means of payments. Flandreau (1996) shows that the Franco-Prussian War (1870) abruptly ended this period of experimentation and development of monetary ideas. Furthermore, the period of the 'Parisian monopoly' of the Bank of France was followed by a short period of a freer legislation on the creation of private banks from 1866 to 1873. This legislation was brutally stopped by a succession of political and monetary crises during the first half of the 19th century. As a result, as mentioned, the French banking system felt behind compared with similar countries.

This relative underdevelopment also has to do with a general feeling of apprehension the French people experienced regarding non-metallic money exacerbated by the monetary and social crises. However, the main intellectual debate in France on monetary matters during this period revolved around the instauration of a system of free banking[3] against a paper-money monopoly in the hands of the Bank of France. A group of very influential policy makers, opinion-makers and professional economists revived the defense of *laissez-faire* systems of bank money issue. In the meanwhile, in England, the well-known debate between the so-called *banking* and *currency schools* ended with the triumph of the latter, imposing a very conservative policy on the Bank of England concerning paper-money supply.

At the same time, a theoretical revolution was taking place in Economics: the so-called Marginal Revolution. Two important French authors emerge, one as a forerunner and another as a main figure in this intellectual movement: Augustin Cournot and Léon Walras. As most of the authors of the Marginal Revolution, they had some ideas on monetary theory. Their contributions were part of the crucial monetary debates of their time and occupied a place beyond the pure applied issues about the management of money supply.

They participated in those debates as pure theoreticians and as revolutionary thinkers. Their contributions on this matter benefited from their solid theoretical frameworks and even they agreed on most fundamental theoretical aspects, their grasp on historical changes and their differences on monetary issues bring into sight a theoretical richness regarding their positions on paper-money that has not received much attention.

The changes in the economy had an important influence on their theoretical contributions to the transformation of Economics. Nevertheless, most of the analysis on these authors has focused on their theoretical positions. Their contributions aside from pure theory have been considered, in the best of cases, as pure theoretical speculation, and most of the time as a minor part of their works. Little attention has been given to their views on economic policy and economic regulation. Regarding the regulation of the monetary system, Walras and Cournot, despite their proximity in economic and monetary theory, have very different stands. Their greatest differences can be found in their views about the convenience of the issuing of paper money and fiat money in general. Whereas Walras is against bank notes, even if coming from a central bank, Cournot has a more moderate position. He accepts the need for bank notes even without a strict adjustment to metal reserves. It can be ascertained that Cournot believes discretionary monetary regulation is convenient and acceptable, while Walras believes the only acceptable monetary system is one based exclusively on the stability of the value of money under a monetary rule following the strict equivalence between metallic reserves (bimetal to be exact) and circulating money.

This paper aims at bringing forth the reasons that explain this difference because of the interpretation each one of the authors gives to the empirical facts of the monetary system taking place at the end of the 19th century. These facts produce diverging developments in each author's theoretical positions. Walras consolidates an extreme position based on the view of money as a commodity, the value of which is determined as the price of the service of a necessary capital good that assures the circulation of commodities. This *good* monetary circulation needs to be differentiated from the circulation of bank issued paper-money, which lies at the origin of deep real crises through an evil cumulative process distorting economic equilibrium and most importantly economic justice. Cournot, on his side, conceives money as something in-between a commodity and an institu-

[3] Some authors sustain there was a period of free banking in France before 1803; however, as said, regional paper-money had a very restricted circulation whereas the Bank of France's paper money circulated beyond the Parisian region.

tion and makes no special difference between bank issued paper-money and metallic money. This view is most evident in his two non-mathematical economic works published in 1877[4] which consolidate his position regarding the need and the desirable effects of the existence of paper money, already present in his 1863[5] work but absent from his well-known mathematical theoretical work (Cournot A. , 2001 [1838])[6].

I will show the difference between these two thinkers and will evidence Cournot's ability to understand more clearly than Walras the evolution of the monetary system of his days. Walras, instead, trying to guarantee the coherence of his pure theory with his applied theory, is unable to accept the evolution toward a monetary system based on fiat money. This paper then aims at contributing to the differentiation of the authors of the so-called Marginalist School, underlining, once again, the richness of the Marginalist period and questioning the commonly accepted view of the homogeneity of their ideas.

The paper is structured as follows: in the first section I consider Walras's approach to the problem of bank issued paper-money as a theoretical construction founded on his pure economics. A critical exposition of his pure theory of money is thus needed before the theory of banking is analyzed. The second section reconstructs Cournot's main ideas on money and paper-money as they were developed in his non-mathematical economic works. Then, in a third section I present an evaluation of the main differences between both authors viewed against the monetary debates of their time.

1. Walras's desideratum for pure metallic-money and the threatening character of paper-money

Walras's analysis of circulation takes us directly from the abstract world of pure theory to a highly practical reality. In fact, Walras considered money as a pure practical object not necessarily having its place within his pure economics. However, the evolution of his monetary theory shows how money became an integral part of his *Éléments d'économie politique pure* (Walras 1988) having its place as the closing device of his whole model. The introduction of a decentralised exchange process implies breaking with the centralised (i.e. well organised) form of the *tâtonnement sur bons*. Beyond this methodological change, it is interesting to note that Walras adds some novelties to the hypothesis of perfect competition to integrate his monetary theory. But this is a high-risk chirurgical modification for him because its main goal is to avoid any disturbance of the normative properties of equilibrium allocations.

Monetary issues are related, even in the pure theoretical arena of his **EEPP**, to the possibility of economic crisis. In fact, it can be said that Walras regards monetary circulation as the door to the introduction of *natural endogenous* sources of crisis, not only as the artificial crisis created by a bad public intervention. Some authors have underestimated the importance of this "devil inside" feature of monetary circulation in Walras's monetary works. The common view on the walrasian notion of crisis is summarized by the following statement:

> Perfectly in line with the century-old Classical tradition, and of course with the other marginalist contributions to cycle theory (notably those by Jevons, Marshall, and Menger), a crisis is considered as a short-run, temporary oscillation around a long-run 'natural' equilibrium determined by `real' variables only. (Bridel 1997, p. 49)

Even if this is true for Walras's early (1860's) works, his studies on money and banking led him to consider crisis are not only part of a short-run oscillation triggered exclusively by "real variables"[7]. In his *Mathematical Theory of Bank Notes* (henceforth **TMBB**[8]) Walras presents paper-money as a dangerous threat for the real economy, exploring monetary causes of real crisis. Most Walras scholars admit this text as proof of deep differences or even incompatibility between his *pure* and *applied* economics[9]. It is precisely on these grounds that I will try to reconstruct Walras's attempt to theorize money under its different forms, and to disentangle his radical stance against any form of paper-money circulation.

a. The nature of money in Walras's Pure Economics

We must take a short detour by Walras's pure theory of money to understand the nature of paper-money issued by private banks. In his **EEPP**, after a lot of transformation across different editions[10], lesson 29 presents a general equilibrium analysis of the circulation of money. Beyond the problems[11] this analysis might have, our interest here is on the economic nature of money.

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4 *Revue sommaire des doctrines économiques* (Cournot A. 1982 [1877]), henceforth *Doctrines*.

5 *Principes de la théorie des richesses* (Cournot A. 1863), henceforth *Principes*.

6 It is worth noticing that this last work had an important influence on Walras, who uses it for his own analysis about the determination of the value of money. In fact, in the second edition of his *Éléments d'économie politique pure* (henceforth EEPP), the 39th lesson dealt with Cournot's analysis of the absolute and relative values and, in particular, with the fluctuations of the value of money.

7 Baranzini presents a clearcut analysis of this evolution of Walras's ideas on crisis (Baranzini 2001)

8 *Théorie mathématique du billet de banque* (Walras, Théorie mathématique du billet de banque, 1992): originally presented in 1879 before the Société Vaudoise des Sciences Naturelles.

9 See (Baranzini 2001), (Bauvert, 2004), (Kuenne, 1961) and (Hilton, 1995).

10 See (Bridel, 1997) and (Rebeyrol, 1998) for detailed expositions and discussions on the evolution of Walras's monetary thought.

11 In a paper coauthored with V. Bignon, we present a critical discussion of Walras's monetary theory (Alvarez & Bignon 2013).

As has been often discussed, the epistemological structure of Warlas's economics is based on the division and interaction between *pure* and *applied* economics, the **EEPP** being the main contribution and synthesis of his *pure* economics[12]. This relation is complex but, in a nutshell, one can say that pure economics represents the ideal functioning of an economy where commutative justice is respected. This simply means that no agent can profit from any form of economic power. This assumption is materialized in the hypothesis of price-taking as the foundation of perfect competition.

But Walras goes beyond the idea that perfect competition ensures commutative justice (or in modern terminology: Pareto-efficiency). He introduces other implicit conditions that must be fulfilled to assure that a general equilibrium state coincides with a fair allocation or that it complies with commutative justice. Money appears related with one of these conditions in a double sense. First, money is necessary for a decentralized exchange economy to attain final (equilibrium) allocations from an initial endowment situation. Second, and more crucial here, the process of exchange or the circulation of wealth must be neutral regarding the real equilibrium allocations. Money must be neutral, and the quantity theory rule must hold. This is the result Walras struggled on along different versions of his pure monetary theory.

In this ideal framework, money is a particular object that allows synchronization between payments and earnings. It is only a problem that consumer agents —mainly workers— face that motivates the demand for money: their expenses take place before they receive their earnings. On the other hand, entrepreneurs need to have enough money to cover their circulating capital expenses. Both types of agents demand money provided it is a generally accepted medium of exchange.

Money demand is thus based on a simple technological social problem in a decentralized economy. Even if Walras's explanation is different from the typical "absence of double coincidence problem", the rationale for monetary circulation is essentially the same: money is demanded as medium of exchange and no other reason is given. However, Walras makes a confusing statement in this theoretical analysis of the nature of money. He presents the *stock* of money as a form of capital held by agents, following Kuenne:

> Note the inclusion of money as an asset yielding saleable services; since one sells the ***services*** of money for one "week" by lending, Walras' money economy is of necessity one with borrowing and lending, and the coexistence of money and a loan market in it a requisite. (Kuenne 1961, p. 96)

The quantity of money that is needed to circulate the entire wealth for a given period is therefore established in the real sphere. It is the solution to the general equilibrium price quantities vectors that solves the necessities of circulation. Of course, Walras recognizes that a unit of money can be used in a sequence of different payments, but this velocity of circulation is taken as given and the obvious quantity theory formula (*équation de la circulation*) holds. Walras dismisses consequence of the nature of money as a form of capital and he concentrates his argument on the nature of the instantaneous availability service of cash holdings rather than on the intertemporal feature. However, as I will show further on, this subterfuge cannot last for long as he needs to confront more realistic forms of money, the bank issued paper money.

Walrasian *pure* monetary theory thus results in a very traditional conception of the effects of the quantity of money on nominal prices. Money, being a technological device to facilitate exchanges, its "services" are the cheapest the highest its supply. Prices and monetary supply are related in a positive manner. What is more important for our purposes here, money supply is given and exogenous all along this theoretical exposition and money is not a commodity. These last features of Walras's pure monetary theory are of great importance.

A difficult point concerning Warlas' theory of money is his normative approach on the nature of money. Even if Walras recognizes the possibility for the existence of non-metallic means of payment as substitutes of a commodity money, he emphasizes the necessity to avoid the endogenous creation of money. In particular, he advocates for the necessity to control, and even to inhibit, the development of the role of commercial Banks in the creation of means of payments.

Concerning the non-commodity character of money, even if the monetary circulation of his pure economics is not bank issued paper-money, one can understand that he tries to establish a very general theory of monetary circulation, not only of the circulation of a particular commodity. The crucial challenge raised here is to explain why an object without intrinsic value or real demand can circulate as pure medium of exchange. Walras solves this puzzle problem giving a great importance to the desynchronization of payments. In any case, money is not demanded because of a pure financial reason or because of its capacity to preserve value in the medium or long term. In the **EEPP**, money is not a creature of financial markets. This leads us to the other interesting feature already mentioned: money supply is determined by an endogenous demand for money. This means that no endogenous creation of the monetary object is considered but the quantity necessary to assure the circulation of the real product is endogenously determined. Money is a part of the initial endowments of some agents and Walras only makes some sim-

[12] See Jaffé (1983)

ple analyses of comparative statics concerning the quantity of money in circulation. These analyses are always related to non-explained exogenous shocks. When a different quantity of money is considered, the adjustment variable is the price of the services as medium of exchange furnished by money. Any expansion on the initial money holdings of agents produces a decrease in the price of that service and a consequent rise of prices in terms of money.

After considering the case of a non-commodity form of money, Walras concludes the 30th lesson of **EEPP** with a short but very important analysis of commodity money. The reasoning is obviously directed towards a theory of the variations on the price of metallic money. Walras's main conclusion, not surprisingly, is that there exists a natural tendency of the real price of the commodity (in his commodity market) to equalize the purchasing power of its monetary form (i.e. coins). The regulation of the value of money in a metallic system needs to consider the real price theory: scarcity and utility being the main forces behind.

b. The nature of metallic money in Walras's Applied Theory of a bimetallic system

The peak of Walras's attempt to defend the neutrality of money, not only theoretically but also in his applied economics, is summarized in two propositions: the necessity for a bimetallic monetary system and the abolition of bank issued paper-money. Concerning the former[13], it is the consequence of his main conclusion about the positive relation between the quantity of money and its purchasing power, and historical events Walras faced, namely the depreciation of gold and the instability of the price of silver related to an increase in its international supply.

According to Walras, the object of any monetary policy is to ensure the stability of the price system and to avoid the introduction of a cumulative speculative crisis. Either deflationary or inflationary spirals lead to a distortion of the price mechanism and *in fine* to redistributive effects distorting the market allocations. If a price system is working properly, under perfect competition, the resultant price vector guarantees commutative justice. Any redistributive effect is undesirable, provided there is no other normative argument on distributive justice[14]. Money-gold or money-silver holders are exposed to fluctuations in their purchasing power when the economy experiences external shocks on gold and silver markets, while debtors see the amount of their debts reduced.

Thus, if a metallic system is the best way to ensure the stability of the monetary supply, this system has drawbacks because of the instability of the prices of gold and silver as commodities. The system Walras proposes to avoid those negative consequences of a pure metallic system, sometimes regarded as very curious, consists in the adoption of a quasi bi-metallic system based on the circulation of gold species joint with the possibility of introducing a secondary form of species, named "regulator-billon" made of silver, when gold-money becomes scarce —either because of an "exportation" of the metal or an increasing use of it as an industrial input[15]. Walras presents this system as a very rigid rule to maintain price stability; a rule that can even be mathematically established and given to the State for application. Walras insists on the necessity of the intervention of the State in monetary matters, contrary as he says, to "the dominant tendency towards laissez-faire" (Walras, 1992, p. 11) of his time. He defends a permanent intervention based on mathematical rules. That is the deep spirit of Walras's monetary policy.

The mono-metallic system with a quasi-bimetallic regulation, apart from its evident complexity, is a clear evidence of the nature of money Walras defended: the only form of money necessary for the economic system to work properly (perfect competition) is a stable metallic medium of exchange. Money supply must be regulated and stabilized and monetary policy needs to guarantee that the quantity of money in circulation does not exceed the necessities of the real price system derived from the general equilibrium equations.

However, historical reality is against Walras's plans. The existence of a *de facto* bimetallic circulation and most important the increasing part of paper-money and other forms of payments are a stinging truth Walras understood well:

> It is a curious fact, and worth to be noticed concerning monetary theory, that it has been considered as a first progress to adopt money and, when it exists, to consider as a second progress to withdraw it. There are in fact an important number of instruments of payment, whose importance is ever increasing, ***without the intervention of metallic money***. Those are: (…) Credits on books, (…) Exchange letters, (…) ***Bank notes*** (…). (Walras 1988, pp. 517-519)[16].

The actual monetary circulation is composed of different forms of money. But what can be said, from a theoretical point of view, about those monies? That is the central question Walras is trying to tackle with his apparently purely applied analysis of bank issued-money. We have now the elements to understand the second stronghold of Walras's monetary policy: the abolition of the bank-issued paper money.

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13 I will deal with the second proposition (i.e. the abolition of paper-money) in the next subsection.

14 Walras deals with those distributive issues in his works on "La question sociale" (Walras 1990) and (Walras 2001)

15 «Le monométallisme-or combiné avec un billon d'argent distinct de la monnaie divisionnaire et qu'on introduirait dans la circulation ou qu□on en retirerait de manière à ce que le prix de l'étalon multiple ne variât pas» (Walras, 1992, p. 5)

16 My translation and emphasis.

c. «Théorie appliqué du billet de banque»: A theory for monetary policy

So far, I have studied the pure theoretical nature of money as exposed in the **EEPP** and the more applied features of the nature of metallic money. Both aspects are strongly related within Walras's propositions concerning the abolition of paper-money. I shall now show that this radical posture against any form of circulation other than his quasi-bimetallic system is based on a difficulty of his pure economics and the necessity to solve it when he develops his applied arguments.

Walras formulated the central question of his **TMBB** as a pure policy matter:

> The production of bank notes ought to be made by the State, or by a unique bank endowed of monopoly power conditioned to a strict agenda, or by an undetermined number of free banks? (Walras 1992, p. 311)[17]

It is worth noting that Walras explicitly considered the difference between an independent and a government controlled central bank. The policy issue at stake is not only the traditional debate on free banking or monopoly. Most of the French participants in this debate —Walras's contemporaries[18]— centered their positions on the option between free banking vs. a central bank; the latter being either a public or a private institution. By recognizing the difference between a central bank guided by government changing policies and one guided by a strict rule (i.e. *cahier de charges*) Walras acknowledges the importance of the debate held in England between the banking and the currency school. However, his answer is very original regarding both forms of the debate. Walras declares a radical opposition against any form of paper-money thus putting the problem on different grounds: a theoretical discussion of policy matters.

I noted at the beginning of this analysis of Walras's theory that his presentation of a pure theory of money tries to avoid any reference to the capital nature of money holdings. Monetary demand, in the pure theoretical view, is determined because of the necessity of a medium of exchange to assure the circulation of the real value of production. Money supply is thus given by money demand, and artificially established by an equilibrium equation of the money service market from which can be automatically obtained the price of money in terms of a numéraire commodity. Some scholars have interpreted this feature of Walras's theory of money as an incompatible theory of monetary supply. Following Bauvert (2004), the general coherence of Walrasian monetary theory is threatened by an exogenous money supply in his **EEPP** that would be incompatible with an endogenous money supply of the **TMMB**. Even if this is apparently true, as it could be thought from what has been said so far in this text, I have a slightly different interpretation.

Walras exposed his radical opposition against any form of fiat money at different places in his pure and applied texts. A common trait of this idea, that is present even before the development of his **TMBB**, is that there cannot be a commodity or any other object serving as an invariable standard of measure of value[19]. The reason for this is simple: values are *in fine* determined by subjective elements —subjective scarcity and preferences— and the very idea of an objective standard of measure is incompatible with a subjective theory of value. Nonetheless, the deep nature of money as pure medium of exchange cannot be separated from its use as a standard of value. If every commodity is to be exchanged against money, the actual vector price of the economy is naturally established in a nominal form —in terms of money. However, Walras always tried to avoid this practical evidence by proposing an interesting difference between the commodity serving as *numéraire* (commodity A in his notation) and the object serving as medium of exchange (commodity U in his notation[20]). This latter being, as I already said, is a pure medium of exchange without any other private utility. This implies this object can only change its value, following Walras's theory of prices, according to its quantity. Any subjective source of value taken apart, the monetary object of the pure economics is obviously neutral and quantity theory holds. This is Walras's theoretical artifice needed to present his *ideal type* system in his pure economics. The conclusion is thus that money supply needs to be adjusted to its demand as medium of exchange if any general perfect competition equilibrium, with its normative properties, is to be attained.

Any perturbation of the supply quantity will trigger an increase of the service of availability of money in terms of a numéraire commodity and a consequent diminishing purchasing power of money. A last consequence of this conception is that money supply must be equal to the medium of exchange demand, and the actual price of money in terms of a *numéraire* becomes a theoretical tautology. This price is determined by a very simple quantity theory equation and the whole nature of the stock of money as form of capital or a support for savings is neglected. But Walras knew and made it explicit, with his characteristic academic honesty, that the applied monetary questions pushed him to abandon the hypothetical conception of a fixed supply of money.

When Walras presents the applied theory of money, money's nature as a form of capital returns

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17 My translation.

18 One of the most important groups of intellectuals advocating free banking during the second half of the 19th century in France is related to the Journal des Économistes (Molinari, Guyot, Bastiat, Chevalier)

19 See the original 29th lesson of the second edition of the **EEPP** where he criticized Cournot's conception of an "absolute" measure of value.

20 See (Walras 1988, p. 449)

to the front of the scene. Walras is confronted to a very hard problem: all forms of intra-period media of exchange are forms of capital from an interperiod point of view. The exchange instruments have different forms according to its support as capital. An important question arises here: why did Walras not include this analysis in his pure economics? The answer, I advance, is this: any demand for money as a form of capital opens the door to redistributive and expectational distortions. These distortions lead to an allocation which is different from those which are Pareto optima —or, in Walras's terms, to distortions of commutative justice.

This interpretation could seem contradictory with the conceptual framework Walras built to introduce money within his value theory. That is, an inter-temporal framework with capital goods and savings. Walras even establishes a demand for money as a form of capital. Money holdings (*encaisse désirée*) appear to be a way of preserving wealth. Walras also considers that in a pure theoretical situation the whole capital takes a monetary form and it is borrowed by entrepreneurs[21]. Money capital and capitalist's savings are identical. Workers' and landowners' savings are also monetized. But, when Walras establishes the money supply for an individual, he presents it as being the total quantity of money from the last period (savings) minus its own demand as medium of exchange and savings for the next period. Adding for all agents, and given a fixed quantity of money between periods, we can note that in equilibrium the whole monetary demand is zero because the whole supply of money for a given period can only be the amount of savings from the last period:

$$Savings(t\text{-}1)\text{-}Transactions(t)\text{-}Savings(t) = Savings(t\text{-}1)$$

The left side represents the net monetary demand for the actual period (t) and the right side the total money supply of the actual period. From which results a nil gross demand for the actual period:

$$Transactions(t) + Savings(t) = 0$$

Walras's mistake is due to a flaw in his definition of the money supply. In fact, when he considers the way an entrepreneur gets money to pay its input costs other than labor, Walras only considers the case of capitalists lending money to them by the intermediation of a bank. But the banks are a pure device to transfer capitalists' deposits (savings) to entrepreneurs. At the end of the period, the entrepreneurs receive the needed quantity of money to repay capitalists and workers by means of their sales. In a stationary state situation, money plays a pure role of medium of exchange transferred between periods (interperiod) to realize payments during a given period (intraperiod). But what does all this have to do with banks and paper-money? The answer to this question is the explanation of Walras's main concern about the dangers of paper-money.

When Walras considers banks from the point of view of pure economics but on the grounds of applied economics, he defines them as a form of entrepreneurs, with a profit maximizing logic. Being more than a simple automatic booking and money transfer system, as they are as long as pure economics is considered, now the banks have a private economic logic that threatens the whole economic system: the capacity to create a new money supply.

Banks carry out this capacity when they go beyond the intermediary function and create a new demand for economic projects. As mentioned above, Walras establishes two distinct categories of agents: capitalists and entrepreneurs. The supply of capital goods, *in fine* of capital money, is the capitalists' main role. Entrepreneurs create products or services and maximize profits through their sales and technological decisions. The problem with banks is they are a sort of monster within this categorization of agents. When a bank decides to lend money to an entrepreneur supported upon no capitalist demand, they are, not only increasing money supply, but also artificially creating a demand for capital. Banks are playing a double role as entrepreneurs and capitalists:

> One must go further than Coquelin and declare that paper money issued by banks pushes the limits of credit by allowing banks and bankers to lend money to entrepreneurs without any capitalist.
>
> (…) The issue of bank notes up to an amount leads to the increase of the same amount of capital. (Walras 1992, p. 319)[22]

The entire predictions of the pure economics model of money, as presented in the last version in the **EEPP**, are threatened. In fact, Walras put this problem in terms of a question: which is the difference between metallic and paper money? His answer is this:

> [The difference is twofold]: First, metallic money has a value in itself, while bank notes only represent the value of the capital goods they will be traded for, and they have no value when those capital goods lose their value; second, after having lent their metallic money for the first time, the banks and bankers are in a way compelled to lend it anew indefinitely, otherwise this value would be idle, whereas the possibility to lend paper money again depends upon people's will. (Walras 1992, p. 320)

[21] It is important to remember a particular theoretical difference established by Walras: entrepreneurs are the direct producers, they search to maximize benefits choosing an adequate technique and inputs; capitalists are the owners of capital, consumers and not producers, lending its capital goods or monetary capital to entrepreneurs and earnings the price or the loan for it.

[22] My translation.

This increase in capital banks produce when issuing paper money means an increase in the entrepreneurs' capacity to buy more capital goods; but the production of new capital goods in order to satisfy this demand takes time says Walras (Op cit. p.321). During this time, the only effect is a "nominal" increase in the means of payments and a consequent depreciation of the price of the whole money supply including metallic money[23].

He thinks the increase in the price of capital goods disappears as their supply equals their demand and the loan is paid back, but the depreciation of metallic money persists. Walras's explanation is as follows: the increase in money supply (paper and metallic) reduces the price of money by a simple effect of excess supply. The real price of metallic money lowering it is then converted into commodity metal (i.e. gold for the industrial gold market) and then the price of this commodity shrinks. Agents exchange gold for paper money at the bank and banks' issue of paper money replaces metallic money if the total amount of metal goes out of monetary circulation. Beyond this point, an inverse movement takes place. This is the ancient bullion theory of "gold points".

But the novelty of Walras's argument lies in the character of banks as entrepreneurs and artificial capitalists. The production of new capital goods to satisfy their demand leads to an increase not only in the demand for capital goods but also of land and labor. Labor and land being inelastic goods, they become more expensive and workers' and landowners' savings increase. These savings are transformed in a form of capital less liquid than the paper money issued by banks. This quite complex reasoning leads Walras to consider that paper money is transformed *in fine* in less liquid assets than metallic money. But what about bankers? The argument above leads to the conclusion that paper money tends to naturally replace metallic money. Walras considers metallic money as the most liquid asset because it is the only generally acceptable medium of exchange. Bank notes are always subject to uncertainty and even when they circulate as medium of exchange, in times of a real or financial crisis an important difference between paper and metallic money will become evident (Walras 1992, p. 338). Bank notes being less liquid than metallic money, it is, according to Walras, impossible to transform, as fast as required, paper money into metallic money. Furthermore, as the central part of the argument is that paper money replaces pure liquid capital by less liquid capital, the bankers are always promising something they cannot deliver.

Walras also explains that this argument against paper money holds whether there is free banking or a monopolist central bank. This also holds even if there is perfect competition in the banking system or a very rigid rule imposed to a central bank. Walras considers that paper money opens the door to an important number of distortions of the exchange system and those distortions are unavoidable.

d. Walras's monetary regulation: no Central Bank please, we need a strict rule!

Despite the possible flaws in Walras's complex arguments, my main interest here was to show that his rejection of any paper money circulation is constructed upon theoretical arguments directly derived from his pure economics framework. In fact, the problem with banks is not their capacity to profit from their position as creators of money and capital. That is to say, the arguments against banks is not based on a violation of the commutative justice as is the argument against natural monopolies (Walras 1992). In the case of monopoly, the Walras's main concern is the capacity of those agents to impose their will by means of their market power. Natural monopolies must be nationalized, as he clearly states regarding railways and land. But banks are not by nature monopolists because competition among paper money is perfectly possible. Walras quotes Coquelin and other famous enthusiasts of the free banking system. He even published some papers in the *Journal des économistes* himself. He admits the possibility of competition among banks to keep them producing reasonable amounts of paper money.

The issue, following Walras, is to be tackled from a different point of view. Allowing paper money circulation leads to the introduction of an internal source of perturbation. A real variable (i.e. an entrepreneurial activity or a supply of paper money matching a real demand in case of a Central Bank) opening the door to a distortion of equilibrium results and of the stationary system of the **EEPP**.

Every form of fiat money represents the same risk for the economy. The only monetary system guaranteeing general equilibrium perfect competition allocations, without introducing the possibility of endogenous crisis, is a system based on a commodity money, and a quasi-bimetallic system regulated by a very strict rule of circulation. This means, Walras is not in favor of a Central Bank producing paper money but he actually proposes a system of monetary circulation with a permanent intervention of the State according to a very strict mathematical rule. No place for discretionary policy is given to this monetary authority. This is not a Central Bank which produces paper money; it is a regulatory authority of the market for gold and silver which must be confounded with money market. This authority's goal is to maintain a stable price of money through a permanent mechanism of monitoring and intervention. This is like the function of modern Central Banks regulating a fixed exchange rate.

Having analyzed Walras's position on paper money, we can now turn to Cournot. This comparison will

[23] Do not forget that Walras believes in a pure quantity theory of money.

contrast Walras's complex arguments with the much more simple and realistic ones advanced by Cournot. This parallel is particularly interesting not only to show the differences between authors associated with the Marginal Revolution, but also because Walras considered Cournot as his most influential forerunner in mathematical economics.

2. Cournot: Paper Money regulation as a matter of *bon sens*

Cournot's monetary theory is not to be found in his first and most known work from 1838 (Cournot A. 2001 [1838]). This well-known piece is his main contribution to a mathematical price theory. But, even there, some important points are made about money. In the chapters on "absolute value" (chapter 2) and "exchange rate" (chapter 3) we find the corner stone of Cournot's theory on the nature of money as a human institution necessary for the progress of human industry. After some general considerations, Cournot studies the determination of the price of metallic money though an algebraic exposition of the theories of reflux and "gold points". At the end of Chapter 3 he remits the reader to Adam Smith's work on the exchange rate and the price of metallic money. No doubt, this is not enough to build a complete and original monetary theory.

It goes without saying that Cournot's monetary theory has been almost completely neglected compared to his price theory, with the notable exception of Loiseau's (1913) work. In his doctoral dissertation, this author shows Cournot gave great importance to the study of money, and to the analysis of credit and the banking system as a natural, necessary and critical evolution of the industrial system.

a. From a static price theoretical framework to a long-term institutionalist dynamic analysis: Cournot's economic works from 1838 to 1877

Cournot's original analysis of monetary matters can be found in his two last economic works: (Cournot A., 1863) and (Cournot A. 1982 [1877]). Contrary to his most known work (1838), in these two texts Cournot uses no mathematical language. In the preface of both works, Cournot explains that by doing this he is trying to address a larger public because he believes the little success of his first book is due to the use of a mathematical language. Cournot gives another reason explaining the absence of mathematics from these works in a letter to Walras published by Etienne Antonelli in *Econometrica* (Cournot, Walras, & Jevons 1935, pp. 119-120). In it, Cournot says that, due to a serious visual disease, he was forced to use a reader since 1830, making it almost impossible for him to read and write mathematics.

However, these two works are as rigorous as his mathematical work. In them, Cournot uses, without significant change his main theoretical model of price determination as presented in his 1838 book. Moreover, those works also suggest a more mature intellectual production. The possibility to go beyond the mathematical language allows him to propose more complex and realistic arguments. Besides, the long period between the first and the second text (almost 30 years later) gave Cournot the time to ponder and most importantly to read vastly new productions in economics. This is more noteworthy considering his last work (1877), written as a last theoretical statement that shows a confident sentiment in the triumph of his original idea of a mathematical and marginalist economic theory.

In detail, those mature works present a theory of long-term economic dynamics. This is their main difference compared to his first book. In this dynamic context, Cournot analyses the role of money in the history of economic evolution. His views on money are thus determined by a historical conception. But this long-term scope is also completed with very practical and contemporary debates. Cournot addresses the questions of free banking and of the regulation of non-metallic money.

Assuming a long-term historical point of view, Cournot presents the evolution of human economy, beginning with a primitive rural economy until an industrialized one. Money or, better said, the means of payments system, naturally evolves from a very simple one, allowing few trades among agricultural almost autarkic units towards a very complex financial system and fiat-money.

> Let's put it briefly (…), first let's recognize that the notion of exchange of one material object against another material object (…) is a very concrete one. But the function of a numéraire or of coinage leads, by virtue of language and by the impulse of human mind, to consider an idea of value that is at a higher level from the point of view of mental abstraction, in a stronger relation with human reason and law. It seems very simple to understand that the people at the origin of arts, sciences and jurisprudence have also been at the origin of the institution of money within the economic system (Cournot A. 1982 [1877], p. 89)[24]

This quotation summarizes Cournot's view on the nature of money. He advances an institutionalist view of the origin and evolution of money. If he recognizes that every single rural economy, provided they have even a few trades, need to use a common standard of value and that this role is naturally given to a particular commodity, he also considers that the economic transformations and progress of societies need the development of credit, metallic money and paper money. Those are creatures of the human mind, not

[24] My translation.

of nature. The abstract character of paper money and of financial instruments is the peak of this institutional development. These elements are initially introduced by a profit maximizing action of some agents, but they need public powers to become stable and to work properly. This is the theoretical background for Cournot's analysis of paper money; very different compared to Walras's theory of the nature of money, presented to complete his pure theoretical system.

b. Cournot and the natural propensity towards a fiat money system

Cournot conceived paper money as part of an ongoing evolution of the payment system. However, this evolution is not a straight monotonic line of permanent and positive progress. On the contrary, the raise and evolution of paper money is a source of some evil; especially, when political power abuses it. Cournot, in a very equilibrated and realistic way, presents the origin of paper money because of the natural needs of a society whose population and wealth are increasing. This is a characteristic of industrial societies not of rural stationary ones.

Technological development, capital accumulation, and the division of labor are the foundations of economic growth. These elements cannot flourish within a pure metallic monetary system. The reason is quite paradoxical. Metallic money was historically adopted because of its natural stability and stable supply. However, the "needs of circulation" of industrial societies are always changing. Crisis and booms are strongly tied to industry. Agricultural societies are exposed to climatic change, but industry is exposed to human creativity (op. cit. p. 43).

Following Cournot, the stability of a monetary standard is as chimerical as the stationary state of an industrial society. Therefore, industrial progress needs an institutional agreement on an "artificial" standard of value:

> Once one has admitted that metallic money[25] is not a fixed standard of value, that it is exposed to real fluctuations, not only on its relative purchainge power but on its own absolute value, it is a natural thing that men conceived the idea of a money of account in order to deal with the alterations on the value of precious metals. (…) So doing, men have not acted in a metaphysical way (…)
>
> The instauration of a money of account, as reasonable and fair as it seems when its goal is to better the conditions of measuring values avoiding the variations of the value of metals (…), becomes a harmful institution, a source of trouble for the ideas and human conscience, (…) (Cournot A. 1982 [1877], p. 68)

Cournot considers that money can be used to finance government expenses, for example in war times, and the abuse of political power is the drawback effect of the positive progress related to non-metallic money. This is a common trait of his general views on money and monetary regulation: a permanent oscillation between good and evil, between crises and prosperous periods. This corresponds to the spirit of a discretionary regulation of the monetary system by the State provided it is made within reasonable limits.

c. Banks, paper-money and monetary Policy: three necessary evils

Cournot keeps this pragmatic view when his story about the evolution of payment systems arrives to the point of the consolidation and spread of paper money. He states that paper-money is a necessity, but its value is unstable. Therefore, government intervention is needed to set up a common standard value and to regulate its production. Banks provide credit instruments and in so doing create paper money. Paper money becomes not only a substitute for metallic money but an integral part of money supply. Cournot, once again, has a very different stand from Walras regarding paper money. He believes it cannot be told apart from metallic money from the point of view neither of common sense nor of pure theory. Trying to establish a difference is going against the very nature of the payment system: a necessary device for the well-functioning of an industrial economy.

> (…) money is money, a sui generis thing, and it is no more a bill of exchange than a commodity, but it has some affinities with both. (Cournot A. 1982 [1877], pp. 89-90)

The way the government ought to regulate the functioning of the monetary system depends on circumstances. As in Walras, banks lend money and create paper money according to need. However, Cournot considers that this is a source of growth and progress. But this must be handled with care. Cournot's argument is summarized in the following quotation:

> With good judgment and wisdom on the administration of paper-money issue, always harmonizing as possible the quantity according to the real circulation needs, Government can balance things in order to maintain more or less stability of the price of paper money: provided that, on its side, the population keeps their natural common sense from the excess of either panic or infatuation. (Cournot A. , 1863, pp. 263-264)

It is interesting to note that Cournot refers to inconvertible and legal-tender paper money issued by a monopoly bank (i.e. Bank of France). With the usual warnings, he considers that there are some limits within which inconvertible paper-money does not

[25] Cournot uses the word "argent" (silver and money in French) to designate any form of metallic money (1982 [1877], p. 67).

harm the economy provided there is a dose of good sense (*bon sens*) of both Government and private agents. Cournot does not provide exact formulas for *bon sens* in monetary policy. He considers intuition and observation of the ongoing situation of the economy are more accurate than sophisticated mathematical theories.

d. Inconvertible Paper-Money vs. pure metallic money

Cournot introduces a similar argument to the one Walras uses to explain the consequences of an excessive supply of paper money. This argument is based on the well-known mechanism of the gold price as a regulator of the price of metallic money:

> The Bank can make use of this power to stimulate, to increase general production or the movement of enterprises and business, as far as a decrease in the value of money (either metallic or paper), and as long as it does not trigger a commercial crisis if the movement it produces is too abrupt. To say that bank notes, issued beyond the needs of real circulation, will come back to the bank in order to redeem them, is to suppose the public confidence has already been demolished. Otherwise, why take paper money back to the bank rather than buying metallic money? (Cournot A. 1863, p. 253)

Contrary to Walras, Cournot believes in the possibility of good consequences of the increase in paper money supply within the limits of public confidence. He conveys modifications of money supply will destabilize nominal prices and thus the purchasing power of money. However, he also recognizes that it is impossible, under the actual conditions of technology and economic knowledge, to implement a better monetary system.

Cournot refers to a bimetallic system, very similar to the one Walras imagined, and arrives to the conclusion that it is certainly an ideal system, as a philosophical matter, but:

> The double metallic standard is less easy to handle for any Government, because it implies the difficult task of permanent screening and correction of gold and silver prices and frequent modifications of the official rates as soon as differ too much from commercial rates. How could the Government accept that a speculator became rich harming consequences the Country (…)? And how could the Government impose to its people the obligation of receiving a commercially devaluated value as their payments? (Cournot A. 1982 [1877], p. 80)

The permanent threat of speculators is a reality as well for metallic money as for paper-money. The implementation of a stable monetary standard is a main concern, but a pure metallic system implies too hard a task and very strict policies. It is, from this practical point of view, an undesirable system.

Governments have other mechanisms to keep the circulation of paper money stable. Legal tender is one and Cournot also considers the importance of taxation and public expenses as one of the main forms to assure paper money circulation. Under difficult economic or political conditions, the Government can reasonably decide to stop convertibility. How could it be possible to avoid panic and a confidence crisis on paper money? The answer is to maintain a stable demand for it. Legal tender is an acceptable policy when panic or any unreasonable psychological reason is at the origin of a depreciation of convertible paper-money. Cournot is extremely clear on this matter:

> A problem, a suspension of convertibility from the Bank, shall be a cause of depreciation of bank notes. And as it is impossible to distinguish the limits between those psychological phenomena named fright and panic, the depreciation could lead to the complete failure of fiat money, if government did not have the possibility to take one of these two measures: one consisting on accepting them as tax payments at their nominal price, the other consisting on compelling legal tender for bank notes at their entire nominal value. This last solution is by far more adequate in order to allow fast and smooth overcoming of a crisis: because for every agent the liabilities and payments are taken at the same nominal value. (Cournot A. 1982 [1877], p. 76)

The economic rationale for legal-tender policies is clear: stability of the contracts is assured by a common restriction affecting debtors and lenders in the same way. The imposition of the payment of taxes and public fees in paper money is another possibility to support paper money circulation but Cournot also acknowledges that this is a dangerous policy because it opens the door to Government manipulation. In any case, Cournot recognizes and economically justifies monetary policies that Walras would reject because they are a dangerous threat for the commutative justice of a market economy. Cournot considers monetary policy as a *service public* (1863, p. 200), needing to be ruled with caution but also discretionary.

3. Concluding remarks: Walras, Cournot and the *currency* school vs. *banking* school debate

These two important theoreticians advanced original thoughts on monetary matters; views that were not usual in the monetary debates of their time. The historical and intellectual context to which belong Walras's and Cournot's monetary analyses was dominated by the banking vs. currency schools debate on central banks, on the one hand, and by the free banking vs. central bank divide on the other. These two debates had common points and they were related

to theoretical views on money. The central issue at stake in both debates was the definition of money and of paper money and credit instruments. The question was whether they could all be considered as part of money or if only metallic currency could. Most of the arguments were given in terms of liquidity or solvability risk of fiat monetary forms.

Walras's monetary policy is not easy to classify according to these debates. We can say that Walras opposed both free banking and central banking. Actually, he opposed monetary creation by banks. Even if he acknowledges the importance of financial developments, of stock markets and credit, he considers these developments are a permanent source of danger for the stability of a perfect competitive general equilibrium system. His opposition is not based on a simple denial of the central role of banks in a dynamic economy; he believes that banks, guided by their well-founded self-interest, can disturb economic prices. This argument is based on a very interventionist conclusion: the natural function of a free financial and credit market is dangerous for a market economy. The financial system must be strictly regulated and the system of payments must be kept from financial fluctuations. His quasi bimetallic system is based on strict rules and permanent intervention of the State to assure the distinction between finance and credit on the one hand and money on the other. Monetary circulation needs to be a neutral device in the economic system.

The walrasian point may be understood as Currency School principle. Nevertheless, Walras's proposition is much more extreme and the only similar idea that we can find is Irving Fisher's 100% Money (Fisher 1997 [1935]). According to this proposition banks are simple mediators between real production and savings (Diatkine 2002, p. 151). I have tried to show that it tries to avoi9d a difference between the theoretical role of banks at work in the **EEPP** and their real role. From the *pure economics* point of view, Walras presents banks as simple deposit banks not creating any new form of currency other than a mechanical transfer of monetized savings into monetary capital borrowed by entrepreneurs. But, when his applied theory considers banks, he is forced to recognize the capacity of banks, as entrepreneurs, to create new forms of currency. This is a source of perturbation and instability. This is what Walras is trying to avoid.

Cournot develops very realistic and midway appreciations of the financial developments of his time. He did not present banks or credit or finance as a danger but as consequence of progress. However, paper-money and banking could be a source of instability: a necessary evil. Cournot did not analyze the case of free banking, he always took as given the existence of a Bank, a central Bank. He warned about the risks of this monopoly but never proposed to eliminate the monopoly; instead, he believed it was necessary keep its functioning within reasonable limits. He compares the Bank of France with the Bank of England on the handling of crisis and the instauration of legal tender. He concludes the latter played its role better because its timing in the imposition of legal was perfect and because it withdrew when necessary. Instead, the Bank of France was permanently exposed to the arbitrary influence of government and legal tender was an instrument to abuse of it.

This pragmatic approach makes very difficult to classify Cournot's monetary thinking. He did not develop an argument "100%" in favor of metallic money, but he considered it could be stable if paper-money was a complement. Cournot regarded any form of credit, fiat money or financial innovation as related to the ever-increasing necessities of industrial societies. His long-term views on the historical evolution of economic systems allowed him to present those elements at the same level as arts, literature, technology, etc.

Cournot always considered practical solutions. Easy to implement and always trying to avoid the temptation of too complicated "scientific" propositions on monetary matters. Those "philosophical utopia will always be overtaken by reality", he ponders (Cournot A., 1863, p. 246). This could be his message to Walras.

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