

***SOCIAL COMPTABILISM AND PURE CREDIT SYSTEMS:
SOLVAY AND WICKSELL ON MONETARY REFORM****

by

Mauro Boianovsky (Universidade de Brasilia)

Guido Erreygers (University of Antwerp)

1. INTRODUCTION

Around 1894 the Belgian industrialist Ernest Solvay launched the idea of replacing the existing “mechanism of money” by a new mechanism, which would preserve the benefits of the old system, but would avoid its inconveniences. He coined the new system “social comptabilism”. It would consist of the abolition of (metallic) money and its replacement by a system of accounts. All economic transactions would be mediated by appropriate inscriptions on the debit or credit side of the accounts of those involved. Solvay not only launched the idea; he also spent a great deal of effort in order to spread the idea. He founded and financed the *Institut des Sciences Sociales* to examine the system in a scientific way. His collaborators studied the Post Office Saving Bank of Vienna, considered to be a prototype of a social comptabilistic institution, and drafted a law proposal aimed at the creation of a similar bank in Belgium. A propagandistic brochure was sent to famous economists, including Léon Walras. Solvay himself described in detail how one could gradually move from the old to the new system, and gave numerous speeches in the Belgium Senate in a vain attempt to win support for his plans.

A similar proposal was formulated in the late 1890s by the Swedish economist Knut Wicksell. In chapter 6 of his book *Interest and Prices* Wicksell introduced the “purely imaginary case” of a “pure credit economy”, in which money does not circulate and “all domestic payments are effected by means of the Giro system and bookkeeping transfers”. Wicksell returned to this idea more than once in later works, including volume II of his 1906 *Lectures*. With a neoclassical background

* The paper has been presented at the fifth *European Conference on the History of Economics* (“The ‘Experiment’ in the History of Economics”), Cachan, France, 22-24 April 1999. We thank our discussant Flavio Comim and other participants of this conference, as well as Wilfried Parys,

quite different from Solvay's, Wicksell conceived of the pure credit economy as part of his study of the demand for money and its velocity of circulation, which he considered to be a crucial element in the explanation of the determinants of the price level. He came to the conclusion that the existing monetary system of his time was gradually approaching the pure credit case, where the price level is decided only by the rate of interest, since what we now call the "real balance effect" is absent from every market. Wicksell pointed out that such a process was being held back by the use of gold as the standard of value (which was in contradiction with its replacement by credit as store of value and medium of exchange) and suggested the abandonment of the gold standard, followed by a law giving power to the central bank to attract interest-earning deposits and make loans at the same rate of interest, which would become the basic rate of interest of the system.

Solvay's and Wicksell's view that the existing monetary system should be reformed is consistent with the importance of "experiments" in their frameworks, albeit for different reasons, as we shall see below. The concepts of social comptabilism and pure credit advanced by those two authors can be compared to the ideas put forward by Black (1987[1970]), Fama (1980), Greenfield and Yeager (1983, 1989) and Cowen and Kroszner (1994), which have attracted attention under the label "New Monetary Economics". According to the "New Monetary Economics", in completely unregulated payment systems all media of exchange would be bank-issued or "inside" money, which would be separated from the unit of account defined as a single commodity or, preferably, as a commodity bundle. In such a system, its proponents claim, the price level would be stable and the quantity of money would be demand determined at its optimal amount. The historical survey of the (pre) history of new monetary economics carried out by Cowen and Kroszner (1994, part III) considers Wicksell's pure credit, but overlooks Solvay's contribution and the French literature in general. We shall see that despite a few similarities between the "New Monetary Economics" and the proposals put forward by Solvay and Wicksell (especially as far as Solvay's notion of an "abstract" unit of account is concerned), there are important differences, including their divergent views towards laissez-faire payment systems.

2. SOLVAY ON EXPERIMENTS

The young Ernest Solvay must have had a great confidence in the experimental method. In his earliest recorded writing on social questions he wrote: “Vous choisissez la voie positive, sûre, égalitaire, la *méthode expérimentale*, base de tous les progrès scientifiques modernes.” (Solvay, 1871; *NLD*, II, p. 9)¹ This attitude may have been influenced by his successful experiments with chemical processes. The basis of Solvay’s fortune was the patent which he obtained in 1861 for the industrial fabrication of soda (sodium carbonate, Na_2CO_3) by means of ammoniac. Solvay did not ‘invent’ the process, but he was the first to find a way to exploit the process on an industrial scale. He managed to do so by a combination of intuition and tenacity (Elkhadem & Mayer, 1997, p. 143) and a number of trials and errors in the gaz factory of his uncle. *Solvay & Cie*, the company founded by Ernest and his brother Alfred in 1863, had a difficult start, but began to thrive in the 1870s.

In the late 1870s Solvay launched himself fully into investigations of a purely scientific character. As he recalled much later, in 1858 he arrived at an intuition which gripped his mind with “une intensité extraordinaire” (*NLD*, I, p. 280)²: not only matter has mass, but also heat (energy). For about twenty years he kept the idea to himself, but then he decided both to submit the idea to at least one renowned scientist - the Belgian chemist Jacques Stas (1813-1891), who reacted quite sceptically - and to try and prove it by means of experiments. A first experiment consisted of provoking, in a closed copper cask, a chemical reaction releasing an enormous amount of heat; the cask exploded, however, as described in detail in a paper by Ernest Solvay & René Lucion (1877). Other experiments soon followed, one of which involved a specially constructed ‘shocking machine’ (a description is given by Lucion & Brichaux, 1924; cf. also Dony-Hénault, 1942). All of these experiments failed, however: it seemed impossible to prove

¹ With respect to Solvay’s writings, the date given in the text corresponds to the year of the first publication. For publications included in Solvay (1929), *Notes, Lettres et Discours d’Ernest Solvay* [*NLD*] we refer to the volume number and page numbers of that edition; for the remaining ones, the page numbers refer either to Solvay (1900b), *Etudes Sociales. Notes sur le Productivisme et le Comptabilisme* [*NPC*], or to the original publication. See the bibliography for more detailed information.

² Solvay explained this in a secret *mémoire* which he deposited at the *Académie des Sciences de Belgique*; excerpts have been published by Lorentz & Herzen (1923) (*NLD*, I, pp. 273-283).

that energy had a material support and to measure that the production of energy went together with a loss of mass. As he explained later in his secret *mémoire* of 1896:

Cet insuccès ne put me décourager. En y réfléchissant, les expériences faites prouvaient une fois de plus que l'équivalent matériel de la chaleur n'était pas décelable dans les conditions où l'on avait opéré, rien de plus. D'autre part, des considérations de diverses natures m'amènèrent à penser que cet équivalent devait être tellement minime que le raisonnement seul, aidé du calcul, pouvait permettre de le déterminer, si toutefois il est déterminable. (*NLD*, I, pp. 282-283)

This episode in Solvay's life is interesting in two respects. First, it raises the question whether he in some sense anticipated the basics of the relativity theory of modern physics. After his death, Lorenz & Herzen - both active members of Solvay's *Conseils de Physique*, the first as its president and the second as one of Solvay's close collaborators - politely judged that his guess was a 'fortunate intuition' (*NLD*, I, p. 283); Isabelle Stengers (1997, p. 154) recently characterized it more bluntly as a 'simple homonym'. The second thing we have to notice is that Solvay's negative experience with experiments pushed him in the direction of research primarily based upon deduction, a preference which he kept until the end of his life. This is clearly illustrated by his declarations on the occasion of the first *Conseil de Physique*, held at Solvay's invitation in Brussels between 29 October and 3 November 1911. He handed over to the participants - the leading physicists of the time - a note with his "théorie gravito-matérialitique" (Solvay, 1911b). In the opening address he declared to have followed the deductive method, and candidly described his approach as 'physical philosophy':

(...) cette étude est d'ordre plutôt de philosophie physique que de physique courante. J'émetts depuis plus de quarante ans l'opinion que, pour la reconstitution mentale *essentielle* de l'Univers actif à laquelle nous travaillons tous avec conviction, le dernier mot de suprême éclaircissement devra être dit par le philosophe plutôt que par l'expérimentateur: dans cette voie, ce ne sera plus, en général, l'expérience qui devra par la suite, continuer à provoquer le calcul, c'est le calcul qui devra surtout, dorénavant, provoquer l'expérience. (Solvay, 1911a; *NLD*, I, p. 117)

He was convinced that the role of the experimental method in the 'science of principles' was transitory, and that the lead would soon be taken by the 'chastened philosophical method'. When closing the Council, he wished nevertheless that the experiments which he had in mind to confirm or reject his

hypotheses could take place, and he kindly invited the specialists to help him with this (*ibid.*, pp. 120-121).³

Solvay's position and wealth allowed him to put himself in the high and comfortable position of a pure theorist and to relegate the low tasks of experimenting and verification to his collaborators.⁴ He could easily afford to define and pursue his own research projects without having the need to conform to the then prevailing scientific habits. Both in his physical and his social and economic research, he was proud of his independence. In an article in which he summarized his views on the social question, he stressed: "C'est impartialement et sans parti pris que j'ai travaillé, mais en ayant pourtant le sentiment du résultat auquel je devais aboutir: j'ai agi comme un expérimentateur dans son laboratoire." (Solvay, 1898b; *NLD*, II, p. 212). Taken in isolation this quote could suggest that Solvay gave prominence to the experimental method in his social and economic research, but this is certainly not the case. Here too, Solvay elaborated the general principles and let his collaborators deal with the facts. The foundation of the *Institut des Sciences Sociales* in 1894 serves as an example.⁵ In May 1894, Solvay had urged the Minister of Finance to create a specialised organism to study social and economic questions (Solvay, 1894a; *NLD*, II, pp. 71-72). Since the Minister did not take any initiative in that direction, Solvay decided to do it all by himself, taking charge of all the expenses. Perhaps he rushed things somewhat; later he would declare that he had founded the *Institut des Sciences Sociales* "à titre d'essai", characterizing it as 'provisional' in comparison to the 'definitive' *Institut de Sociologie*, founded in 1901 (Dejongh & Hanssens, 1901, p. 17). Anyhow, he intended the institute to be heavily oriented towards his own preoccupations. The precise goal of the institute was to complement Solvay's deductive way of reasoning by a more inductive approach:

Indépendamment de recherches plus générales, s'étendant à l'ensemble de la

³ He returned to the same theme in a speech held a year later, declaring that his scientific action for almost 30 years had been dominated by "une grande préoccupation philosophique, celle de trouver à la science de l'univers une interprétation simple, par voie de déduction, à partir de postulats parfaitement établis tels que celui qui régit la gravitation universelle." (Solvay, 1912; *NLD*, I, p. 261). Hence mathematics was his great example, and certainly not the experimental, inductive sciences, like chemistry, of which he abhorred the 'abundance of hypotheses, complicated theories and limited ways of doing experiments' (*ibid.*, pp. 261-262).

⁴ He did occasionally cease to cooperate with collaborators who did not go far enough in his direction; cf. Solvay (1895); *NLD*, I, p. 16.

⁵ For a more detailed analysis of the foundation: Crombois (1994, pp. 23-33) and Erreygers (1998, pp. 228-229).

sociologie, cet institut poursuivra, par l'observation et l'étude des faits, l'examen impartial et approfondi des conceptions *à priori* que j'ai cru devoir formuler, en les soumettant au contrôle de la méthode inductive." (Solvay, 1894b, p. 3)⁶

3. SOLVAY'S SOCIAL COMPTABILISM

Contemporaries such as May (1897) and Walras (1897) perceived the *Institut des Sciences Sociales* as an institute founded mainly to study and to prepare the practical realization of Solvay's social comptabilism. Although Solvay's initial plan was somewhat broader, it is true that social comptabilism dominated the activities of the institute. Besides Solvay the main collaborators of the institute were three notorious Belgian socialists: Guillaume De Greef, Hector Denis and Emile Vandervelde. The foundation of the institute went together with the creation of a new journal, the *Annales de l'Institut des Sciences Sociales*, in which the results of the ongoing research at the institute were published. All in all 33 issues, or 6 volumes, of the *Annales* came out, covering the period from 1894 to 1900. This is our main source of information, since unfortunately the archives of the institute have been lost.⁷ Compared to what he published on social questions before 1894, Solvay's output in this period exploded. In the *Annales* he published altogether 17 notes and articles, while his collaborators at the institute and others contributed about 20 notes and articles which are more or less connected with Solvay's ideas.

In the very first article which was published in the *Annales*, "Comptabilisme et proportionnalisme social", Solvay strongly connected his ideas on money to the issues of inheritance and inheritance taxation. It was not the first time that he made this link⁸; he also stressed it in a speech before the Belgian Senate, in which the first reference can be found to "un certain comptabilisme social" (Solvay,

⁶ Two years later he referred to his own contribution as "l'exposé sous forme exclusivement théorique de la conception que nous avons soumise à l'examen et à laquelle se rattachent les recherches inductives de nos collaborateurs" (Solvay, 1896; *NLD*, II, pp. 230-231).

⁷ No systematic study of the activities of the *Institut des Sciences Sociales* exists. We have partial information gathered by a contemporary observer - an article by Dick May (1897), pseudonym of Miss J. Weill - and by a later collaborator of Solvay, Warnotte (1946, pp. 520-529). The most recent account is by Crombois (1994, pp. 25-33). Vandervelde (1895, p. 230) indicated that certainly in the beginning Solvay and his collaborators at the institute worked 'collectively' around Solvay's research programme.

⁸ Tassel (1920, pp. 45-46) had access to a draft of letter of March 1890 in which Solvay mentioned "*la taxe à la mort, le compte social*" as solutions to the social and economic questions of his time.

1894a; *NLD*, II, p. 68). The main proposition of “Comptabilisme et proportionnalisme social” is that, in order to have the intended effect, the introduction of an inheritance tax has to be combined with the abolition of ‘exchange money’ (“monnaie d’échange”). When talking about the inheritance tax, Solvay had in mind a very ambitious project. He proposed in fact to replace all existing taxes by a single tax on bequests (in later articles he specified that the inheritance tax should be progressive with the number of generations between the original creator of the capital and the inheritor, the so-called “impôt successoral réitéré”). It is in the course of an examination of the critiques which might be raised against his proposal that money appears. Two of those critiques were that high inheritance tax rates might encourage fraud on a large scale, and that a system based on a single tax might be inferior to a system based on multiple taxes, since in the second case the errors and the inequalities caused by fraud compensate one another in a certain degree. Yet Solvay was not impressed by these critiques and thought that it would be possible to find a way to eliminate fraud. The miracle solution, so to speak, would be to replace the existing monetary system by a system of accounts managed by the state:

(...) pour que la fraude devienne tout à fait impossible, et que l’impôt unique apparaisse comme pratiquement réalisable, il faudrait que les citoyens soient directement intéressés à faire connaître le montant exact de leur avoir. Ceci nous amène à indiquer notre seconde formule: *remplacement de la monnaie d’échange par un système de comptabilité institué par l’Etat*. (Solvay, 1894b, p. 14)

Solvay’s idea was to introduce a system which would enable the state to perfectly monitor the economic transactions of its citizens, and hence to determine exactly the wealth of each individual. In Solvay’s own words, the system would be “(...) une sorte d’appareil enregistreur de toutes les transactions, qui permettrait de constater à chaque instant, avec une exactitude suffisante, le droit et l’avoir de chacun” (*ibid.*, p. 5).

In 1896, however, Solvay began to have second thoughts and openly regretted the ‘premature’ publication of the article “Comptabilisme et proportionnalisme social”. He therefore decided to return to the question, but this time “en restant sur le terrain monétaire et comptabiliste pur” (Solvay, 1896; *NLD*, II, pp. 229-230). The resulting article “Principe et raison d’être du comptabilisme social” is a key reference for Solvay’s social comptabilism. Together with an article and a bill

written by Hector Denis, it was reprinted in 1897 as a ‘propagandistic brochure’ under the title *Le Comptabilisme Social*; the brochure was also published in English and German. Although in the following years Solvay refined his propositions at several occasions, the basic ideas remained the same. The main question which he tried to answer in the article was the following⁹:

Would it be possible, in a society constituted as ours is, to replace the agency of money by another agency which would have its advantages without its inconveniences, and which could be considered as theoretically perfect, - in other words would it be possible to replace the agency of money by a system which would be the final expression of possible improvement in this matter and the definitive point to which social economics ought necessarily to tend? (Solvay, 1897a, p. 1)

The main inconveniency of the monetary system to which Solvay alluded is that it entails the use of a unit of measure which is variable over time. Starting from Solvay’s own equations, we can clarify his reasoning as follows. Let $v(t)$ be the money value of a given good at time t ; it can be expressed as:

$$v(t) = u(t).E(t) \quad (1)$$

where $u(t)$ is a “coefficient of proportionality depending on the unit of value adopted” (*ibid.*, p. 4), and $E(t)$ represents “the account of the conditions of supply and demand” (*ibid.*, p. 5n)¹⁰. Let $v_0(t)$ be the value of gold at time t ; by analogy with (1), it can be expressed as:

$$v_0(t) = u(t).E_0(t) \quad (2)$$

where $E_0(t)$ represents the conditions of supply and demand of gold. In a gold-based monetary system, gold serves as the unit of value, and we will have:

$$v_0(t) = 1, \quad \forall t \quad (3)$$

from which it easily follows that:

$$u(t) = \frac{1}{E_0(t)}, \quad \forall t \quad (4)$$

If we now compare the value of a given good at time t and at time t' , we obtain:

$$\frac{v(t)}{v(t')} = \frac{E(t)}{E(t')} \cdot \frac{E_0(t')}{E_0(t)} \quad (5)$$

⁹ We will quote from the English translation of the article as it appeared in the brochure *Social Comptabilism*.

¹⁰ Solvay specified that $E(t)$ could be seen as a function of $d(t)$, the ‘average desire to possess the good’, $h(t)$, the ‘number of those who demand the good’, and $o(t)$, the ‘supply of the good’. He

Hence, if a change occurs in the ‘real value’ of gold, i.e. if:

$$\frac{E_0(t')}{E_0(t)} \neq 1 \quad (6)$$

it turns out the ratio of the money values of a good differs from the ratio of their ‘real values’, i.e.:

$$\frac{v(t)}{v(t')} \neq \frac{E(t)}{E(t')} \quad (7)$$

Since gold is a commodity, it is subject to variations in value in response to shortage or excess of the money supply, or due to speculation. The ‘real value’ of the unit of measurement will generally change over time, meaning that condition (6) holds. In that case, the change in the money value of a good will not adequately reflect the change in the state of supply and demand for that good. The use of money, therefore, entails confusion and distortion; it is a “defective instrument” (*ibid.*, p. 11) which should be replaced by something better.

The alternative to the money system should be a system with an invariable unit of value. Such a system could be devised by choosing a unit of value at a given moment of time, $t = 0$, say, and expressing all values at all dates in terms of this once-and-for-always unit of measurement. Suppose that the value of gold at time $t = 0$ is taken as unit of value; in equations, Solvay’s suggestion then comes down to replacing (3) by:

$$v_0(0) = 1 \quad (8)$$

Instead of (4) we would obtain:

$$u(t) = u(0) = \frac{1}{E_0(0)}, \quad \forall t \quad (9)$$

and therefore no distortion anymore between the ratio of prices and the ratio of the ‘real values’:

$$\frac{v(t)}{v(t')} = \frac{E(t)}{E(t')} \quad (10)$$

Put differently, Solvay argued that in order to avoid the distortions related to the use of money, it would be necessary to use a unit of measurement which had a material existence at the moment when the unit of value was defined, but which lost its material support thereafter:

returned to these equations in Solvay (1899c; *NPC*, pp. 111-112n), where he tried to connect them to his energetic doctrine.

(...) it will be seen how absurd it becomes to persist in the custom of representing materially a unity which should be detached from the support which has served to define it at a given moment, and which no longer appears as anything but an abstraction permitting in a homogenous manner the arithmetical representation by figures, of the value of things, relatively and individually. This abstract unity ought to be detached from every material tie. (*ibid.*, p. 8)

But would it really be possible to replace the monetary system by a new system based upon an invariable unit of value? Solvay's answer is based upon an analysis of the functions of money. He attributed two functions to money: first, it is "an indispensable instrument for effecting transactions which are not mere acts of barter", and second, "it presents itself as having rendered possible (...) the registering, the writing down or account-keeping of the transactions, if one may say so, which barter did not permit" (*ibid.*, p. 2). In other words, Solvay stressed the role of money as a 'means of transaction' and as a 'means of accounting', but neglected its role as a 'store of value'. As a result he believed that it would suffice to find an alternative way to accomplish the first two functions to replace the existing monetary system, which is exactly what he thought his social comptabilism would do.

The central idea of social comptabilism is that every economic transaction is mediated by appropriate inscriptions on the accounts of those involved in the transaction. A central organism ("le comptable général", e.g. the National Bank) would be entitled to deliver these accounts; everyone who proves to be solvable would have the right to obtain such an account. All economic transactions would be recorded as debit and credit operations. Solvay stressed that the replacement of the monetary system by social comptabilism would not be a revolutionary development, but the accomplishment of a tendency already present in the actual system:

It is evident that in this way society as it is at present organised, can demonetize the precious metals and establish social comptabilism without in principle having to make any revolution whatever in its present position, it has only largely to increase a portion of its machinery, already existing and in full swing. To sum up, it is a question of a simple change in the machinery of transactions and all society is interested in the realization of such a progress purely mechanical and functional, which moreover has no connection with any doctrine, opinion or party, and is no new invention whatever. (*ibid.*, p. 13)

By way of example Solvay referred to the Post Office Bank of Vienna (Austria),

which had links with all the post offices in the Austrian Empire, as a first approximation of a comptabilistic institution.¹¹ Hector Denis wrote an article about this bank for the *Annales* (“Le service de chèques et de virements à la caisse d’épargne postale de l’Empire d’Autriche”), and drafted a bill with the aim of creating such a bank in Belgium too.

The brochure *Le Comptabilisme Social* was sent to a number of economists who might be interested in Solvay’s theory. In volume 3, issues 4 and 5, of the *Annales*, the reactions of Léon Walras, Charles Gide, John K. Ingram and Ladeslas Zaleski were reproduced. Gide’s response was brief, but very positive; he indicated that Solvay’s propositions were quite close to his own: “Je pense que c’est là le système de l’avenir. (...) je suis acquis d’avance à la thèse de M. Solvay.” (Gide, 1897, p. 220)¹² The reactions of Ingram and Zaleski, on the other hand, were negative. Ingram stressed the ‘indispensable’ character of metallic money and concluded: “(...) je ne partage aucunement les idées qui y sont émises. D’après moi, cette abolition de la monnaie métallique non seulement n’est pas à souhaiter, mais elle est impraticable.” (Ingram, 1897, p. 311) Zaleski (1897, p. 312) referred to the Russian situation and predicted that both international trade and national conflicts would endanger the comptabilist system.

The most interesting reaction came from Walras. His reaction was encouraging:

J’exprimerai d’un mot le fond de ma pensée sur l’importance et l’intérêt d’une telle création en déclarant qu’il n’y a aucune exagération à avoir fondé un ‘Institut des Sciences sociales’ tout exprès pour l’étudier dans son principe et dans ses détails, et que M. Solvay mérite à la fois la plus haute estime pour en avoir lancé l’idée dans la science et la plus vive gratitude pour en avoir préparé la réalisation pratique. (Walras, 1897, p. 219)¹³

In the same letter he promised to think more thoroughly about Solvay’s propositions and to communicate his observations to the institute. He did do some additional thinking, and published his reflections in the article “La Caisse d’épargne postale de Vienne et le comptabilisme social” in the *Revue d’Economie*

¹¹ Solvay (1897b; *NLD*, II, p. 255) was nevertheless sceptical about the institution since it was not ‘entirely comptabilistic’, based as it was upon metallic money.

¹² In their book on the history of economic thought, however, Gide & Rist (1915, p. 319) were much more critical of Solvay’s ideas. Later Rist (1938, p. 260) even said that they contained ‘a lot of fantasmagory’.

¹³ A slightly differing version of this letter, addressed to Emile Vinck, the institute’s secretary, was published by Jaffé (1965), vol. II, pp. 722-724.

Politique of 1898¹⁴. Although Walras recognized a high degree of similarity between some of his own equations and those of Solvay, he did not believe it would be possible to create a unit of account with constant value: “Ici, je dois combattre chez MM. Solvay et Denis une illusion résultant de celle qu’ils se font sur la fixité de valeur de leur unité monétaire.” (Walras, 1898, p. 216)¹⁵ According to Walras (*ibid.*, p. 218), social comptabilism would lead to a *cours forcé* of the unit of account, which would be disastrous for economic life; that is why he finally rejected the idea.

Walras’s critique was taken very seriously at the institute. The discussion centered around the third section of Walras’s article, entitled ‘Le comptabilisme social: l’unité fixe de valeur’ (*ibid.*, pp. 210-215). A substantial part of Volume 4, issue 4, of the *Annales*, was devoted to Walras’s analysis. Apart from a reproduction of the relevant section of Walras’s article, it contained an article by Solvay (1898a) on the invariable unit of value, and critical remarks by Denis (1898), Henri Vanderrydt (1898) and Paul Otlet (1898). These articles were reprinted in a brochure called *A Propos du Comptabilisme Social*, published by the institute in 1898. In his reaction, Solvay noted that others seemed to have three difficulties with his theory; it appeared to be hard to understand (i) that the value of goods is ‘absolutely independent’ of money, (ii) that in society money is in principle ‘absolutely useless’, and (iii) what the exact function of money happened to be. Solvay did not modify his position but reaffirmed his previous statements. For him, commodity-money was in essence a ‘means of transaction’:

La chose monnaie devint ainsi un moyen de transaction, l’outil de la transaction. Elle n’a pas d’autre rôle et, au fond, pas d’autre raison d’être. S’il ne fallait pas transactionner, il ne faudrait pas de monnaie; si l’on pouvait transactionner aussi bien d’une autre façon, elle deviendrait inutile. (Solvay, 1898a; *NLD*, II, pp. 258-259)

He thought it would be possible to perform economic transactions without using commodity-money; in that case commodity-money would lose its only function and therefore become obsolete:

Or, précisément, il est possible de transactionner d’une autre manière et sans qu’il soit indispensable d’aliéner quoi que ce soit. Il suffit pour cela qu’à

¹⁴ Afterwards, the article was included in Léon Walras’s *Etudes d’Economie Politique Appliquée: Théorie de la Production de la Richesse Sociale*; cf. Walras (1992[1898], pp. 343-361).

¹⁵ Cf. Bourguin (1913, p. 85n) for a similar viewpoint.

chaque transaction effectuée, au lieu de faire usage de la chose monnaie, on inscrit purement et simplement, on porte en compte des transactionneurs l'import de l'opération effectuée, de telle sorte que l'avoir de celui qui a acquis la chose transactionnée soit grevé de la valeur de cette chose au profit de celui qui l'a vendue.

C'est ce que réalise le comptabilisme social. (*ibid.*, p. 259)

The main point of divergence between Solvay and Walras concerned the possibility or impossibility of having a comptabilistic unit of account with a constant value. Solvay was not impressed by Walras's critique:

La fiction mathématique dont je me suis servi pour démontrer, dans mes notes précédentes, l'invariabilité de l'unité comptabiliste était légitime. Il est exact qu'un être d'une capacité infinie pourrait, à un moment précis du temps, fixer à chaque endroit la valeur - *valeur évidemment constante pendant un temps infiniment court* - d'un nombre indéfini de choses à valeur variable, en fonction de la valeur d'une de ces choses prise pour unité. A partir de ce moment, cette unité ainsi choisie et employée, *n'ayant eu en fait qu'une réalité instantanée*, resterait néanmoins indéfectible dans le temps et dans l'espace. Elle serait l'*unité abstraite* que nous avons cherché à définir et qui pourrait désormais servir, d'une manière constante et indéfinie, pour enregistrer les rapports de valeurs variables des choses, pour écrivurer les transactions en excluant d'une manière radicale la notion et l'acte d'échange. (*ibid.*, p. 261)

In later years, Solvay kept writing about social comptabilism. In 1899 he wrote a series of three 'open letters' to the members of the Belgian Parliament, to inform them about the aims of social comptabilism and to suggest practical ways of realizing it¹⁶. The letters had no effect at all; in a speech delivered on 22 March 1900 before the Belgian Senate Solvay acknowledged his failure to convince his fellow members of parliament. He even admitted that he had serious difficulties to direct the research of his collaborators at the *Institut des Sciences Sociales* towards "une application franchement comptabiliste", and launched an offer to financially support "tout chercheur compétent qui produirait une œuvre sérieuse dans le sens comptabiliste au point de vue réalisation" (Solvay, 1900a; *NLD*, II, p. 121). Not surprisingly, soon thereafter he decided to cease the activities of the

¹⁶ The occasion to write these letters was the proposal to renew the privileges of the Belgian National Bank. In the first letter Solvay urged the members of Parliament to ask the Government to make a study on the transformation of the National Bank into a "Établissement Comptabiliste National" (1899a; *NPC*, p. 89). In the second he indicated more precisely how one could gradually move towards social comptabilism (including designs of comptabilistic booklets and accounts), with the clear message that Parliament and Government should without further delay decide "à tenter un essai du système comptabiliste" (Solvay, 1899b; *NPC*, p. 101). The third letter deals mainly with the issue of interest in a comptabilistic regime; Solvay considered it to be his last contribution on social comptabilism and hoped that "les intéressés à compétence spéciale" would continue his work (Solvay, 1899c; *NPC*, p. 124).

Institut des Sciences Sociales and to replace it by the *Institut de Sociologie*, under the command of Émile Waxweiler.

One cannot say that Solvay's ideas on money were completely ignored or neglected. Yet he thought that his ideas were not appreciated as they should. Probably his expectations were unreasonably high, and moreover some economists harshly criticized social comptabilism. An example of this is Pareto (1965[1903], pp. 280-284), who used the terms 'fundamental error', 'illusion' and 'sophism' when analyzing Solvay's theory. He concluded that the proposed system might have perverse effects, and that its formulation was the result of an ignorance of the laws of economics:

Ce qu'il y a de mauvais dans les projets dont nous venons de parler, ce sont les maux qui naissent des abus de l'émission d'une nouvelle monnaie. Ces maux s'observent là où l'on émet du papier monnaie qui chasse entièrement l'or de la circulation.

Les émissions de papier-monnaie ont généralement pour effet de permettre aux riches de spolier les pauvres, pendant un temps plus ou moins long, et il est curieux de voir des gens, qui se disent et sont animés d'un désir sincère de faire le bien du peuple, proposer des mesures qui aboutiraient à le spolier. C'est une conséquence de l'ignorance des lois économiques. (*ibid.*, p. 284)

Loria (1902, pp. 119-122) also strongly doubted that social comptabilism would be feasible and pointed at the necessity of using labour to fix the invariable measure of value.

A more positive attitude towards social comptabilism was displayed in the French and German literature on money of the beginning of the 20th century. In a book in which he tried to show that a socialist system of exchange cannot co-exist with a non-socialist system of production, Marc Aucuy (1908, pp. 276-349) devoted a whole chapter to a discussion of social comptabilism and even annexed to it an unpublished text of Solvay (*Note inédite de M. Solvay sur le comptabilisme*, dated 6 September 1906, pp. 349-354). As many others, Aucuy too thought that the impossibility to fix an invariable unit of measurement was one of the main weaknesses of social comptabilism. In the same line of thought are the comments of Roche-Agussol (1903, pp. 90-114) and Poudou (1919, pp. 308-315). In the German-speaking countries, Solvay's 'comptabilité sociale' was mentioned in Joseph Schumpeter's (1917-1918, p. 637) review of monetary theory. Walter Wegelin (1921, pp. 34-37, 48-56, 90), and to a lesser degree also Hans Langelütke (1925, pp. 12-13, 40, 82n), compared Solvay's social

comptabilism with the monetary theories of Silvio Gesell and Pierre-Joseph Proudhon. Arthur Wolfgang Cohn (1920, pp. 90-92) noted parallelisms between social comptabilism and some proposals of Friedrich Engels, Edward Bellamy and Justus Reht.¹⁷

4. WICKSELL ON MONETARY REFORM EXPERIMENTS

Wicksell discussed experiments in economics in his inaugural lecture on “Ends and Means in Economics” delivered at the University of Lund in September 1904 (Wicksell, 1958[1904], pp. 58-60). After stating the case for the methodology of verificationism in economics (see Henriksson, 1991, p. 35), Wicksell disputed the claim, put forward by “both friends and foes of systematic or theoretical economics”, that it is in general impossible “to give a strict verification of the propositions or rules which we formulate as hypotheses, as tentative abstractions from experience, because it is impossible to isolate economic phenomena to the extent necessary for such verification. Unlike the natural sciences, economics is not in a position to carry out experiments, they say.” Wicksell did not accept these early displays of “methodological dualism” and sustained that experiments are often made in economics, albeit in a specific form:

It seems to me that this contention is to a great extent exaggerated; as a matter of fact, such experiments are constantly being made in the realm of our science and they are of the most incisive character conceivable, because one economic element is altered discontinuously while everything else remains the same - and the experimenter is the economic legislator. These experiments are frequently even direct and quite deliberate: the measures introduced by the legislation are based upon the supposition that some abstract proposition or other is valid, and the result is either confirmation or refutation of the proposition in question. (Wicksell, 1958[1904], pp. 58-59)

Wicksell did not name the “friends of economic theory” who had questioned the possibility of carrying out experiments, but he probably had in mind J.S. Mill’s (1992[1844], pp. 146-147) statement that moral sciences, in contrast with physical sciences, cannot make controlled experiments, which means that they cannot generally obtain what Francis Bacon used to call an *experimentum crucis*, and, by that, cannot be based on inductive methods (see also Blaug, 1980, pp. 64-69). It

¹⁷ The list of authors with similar ideas has even been extended to Major Douglas; cf. Baudin (1947, p. 623) and Warnotte (1946, vol. I, pp. 323-327).

should be noted that Wicksell was not the first to regard changes in economic legislation as equivalent to experiments. Neville Keynes (1973[1891], pp. 182-184) entertained that notion, but dismissed it in the end, on the feeble grounds that “it is not the case that the primary object of every new law is to afford means of studying the effects which a change of conditions or the introduction of a new agency is capable of producing”. He conceded, however, that what Jevons (1883, pp. 253 ff) had called “tentative legislation” - defined as tentative measures that introduce new economic legislation only temporarily or in a few sectors or regions of the economy “with the express object of gaining insight into their social and economic effects” - could be regarded as experiments.

It is remarkable that all instances of economic experiments given by Wicksell in his 1904 lecture (1958[1904], pp. 59-60) belong to the realm of monetary theory and policy (e.g., Gresham’s Law; the success of the Austrian Government in keeping its inconvertible paper money, by means of the purchase and sale of public bonds, at a higher value than that of the silver into which it was once redeemable; the increase of the value of silver currencies in Holland and India in relation to gold by means of the expedient of ceasing to mint silver coins on private account, etc.). This can be ascribed to Wicksell’s view that, in contrast with relative prices, the conditions that decide the price level are defined by the monetary system set up by society and its government.

In all other economic spheres other circumstances, such as technique, natural conditions, individual or social differences, play a role which science can only imperfectly survey and control. But, with regard to money, everything is determined by human beings themselves, i.e., the statesmen, and (so far as they are consulted) the economists; the choice of a measure of value, of a monetary system, of currency and credit legislation - all are in the hands of society, and natural conditions (e.g., the scarcity or abundance of the metals employed in the currency, their chemical properties, etc.) are relatively unimportant. Here, then, the rulers of society have an opportunity of showing their economic wisdom - or folly (Wicksell, 1935[1906], pp. 3-4).

While attempts to change relative prices (by means of tariffs, state subsidies, export bounties, and so on) “almost inevitably involve some loss of utility to the community” and should, by that, “be regarded as opposed to all reason”, money prices “are a matter in the last analysis of pure convention, depending on the *choice of a standard of price* which it lies within our own power to make”

(Wicksell 1936[1898], p. 4).¹⁸ Wicksell's monetary thought was aimed at the study of the determination of the price level, which provided the analytical basis for his suggestions on how to stabilize the price level through a reform of the gold standard system.

The main feature of Wicksell's approach to price level determination is the investigation of the development of credit as a means to supersede the function of money (gold) as store of value, based on four models of a monetary economy: "pure cash", "simple credit", "organized credit" and "pure credit" (1936[1898], chapter 6; see also Boianovsky, 1998, sections II and III). In the case of the "pure cash economy" there are no bonds; the size of cash balances is decided by the need to meet anticipated future purchases and to have a reserve for unforeseen liabilities (what we now call "transactional" and "precautional" demand for money; cf. Laidler, 1991, p. 125). The stability and determinacy of money prices depend on the existence of what Don Patinkin (1965) would later call a "real balance effect" in the markets for commodities: a fortuitous increase of money prices (and a corresponding reduction of real cash balances) provokes an excess supply of commodities, with ensuing falling prices until the real value of cash balances is restored to its original level (see Wicksell, 1936[1898], pp. 39-41; cf. Patinkin, 1965, chapter 3). Assuming a monetary economy with "simple credit between private individuals" (Wicksell, 1936[1898], pp. 61-62), the necessity for holding cash balances can be reduced as far as anticipated expenditures are concerned, but this does not normally affect the precautional demand for money. The real balance effect can now also be found in the bond market: an accidental increase of the price level brings about excess demand for money and corresponding excess supply of bonds and commodities, which is followed by temporarily higher rates of interest and a return of money prices to their original level.

In the case of an "organized (or developed) credit economy", individuals keep most of their transactions and precautionary balances as interest earning deposit at

¹⁸ Hutchison (1953, p. 240) has contrasted Wicksell's notion of "conscious control" in the monetary realm with Carl Menger's well known hypothesis about the origins of money as a "spontaneous social phenomenon". Such a contrast, however, does not apply, as Wicksell did not dispute Menger's description of the origins of money as the most saleable commodity, and the latter did take part in the monetary reform debate in Austria in the late 19th century (see also Boianovsky, 1998, pp. 583-584). It should also be noted that, despite Wicksell's apparent restrictions to tariff policy, he made it clear that it could bring about under certain circumstances a higher utility for the community as a whole (see Wicksell, 1997[1896], pp. 104-105).

the competitive banking system. In contrast with “simple credit”, in an organized credit system the “subjective element of risk [of not recovering the money entrusted] disappears in proportion as the wealth which affords the guarantee is great in relation to the amount at stake, so that only the mathematical risk remains” (Wicksell, 1935[1906], p. 72). Building on Francis Edgeworth (1888; see Wicksell, 1936[1898], p. 66, n. 1), Wicksell explains that, thanks to the “Law of Large Numbers” of probability theory¹⁹ and to the fact that quite often the bank’s costumers have business relations with one another, the bank’s demand for cash reserves will be just a fraction of its liabilities (1935[1906], pp. 83-84; 1936[1898], pp. 66-68), which means an increase in the “virtual” velocity of circulation of money (gold) when compared with both the pure cash and simple credit economies. Wicksell (1897, p. 238) carried out an exercise similar to the stability analysis he did for a pure cash economy in *Interest and Prices* (1936[1898], pp. 39-40). A fortuitous increase of the price level in a developed credit economy brings about a higher demand for cash, which will in part provoke an “immediate reaction against the price movement” to the extent that individuals reduce their demand for commodities in order to restore their real cash balances. But the reaction comes “above all” in the form of the effects of an increase in the demand for loans (supply of bonds) on the reserves of the banking system. The reaction is not “immediate”, but after a period of time banks will be forced to raise their rate of interest in order to protect their reserves, which helps to bring money prices back to their original and stable level.²⁰

Wicksell’s last and quite influential model of a monetary economy is the “pure credit economy”, where there is no demand for outside currency and all payments

¹⁹ This is the famous “square root formula” advanced by Edgeworth (1888) to explain banks’ demand for reserves. It was used by Wicksell in his account of precautionary demand for money by individuals and banks alike. It is based on a stochastic model in which sampling from an infinite population generates a normal distribution (cf. Wicksell, 1898, appendix). If an individual holds a reserve r (proportional to the standard deviation of his excess of payments), the aggregate holding of one hundred independent individuals would have to be just $\sqrt{100} = 10$ times as great, and the aggregate reserve would be $10r$ (Wicksell, 1936[1898], pp. 66-67).

²⁰ Such a comparative-statics exercise (where there is a once-and-for-all change in the price level, followed by a return to its previous level) should be distinguished from Wicksell’s dynamic cumulative process proper. In this case, a (say) increase of the “natural rate of interest” brings about excess demand for commodities and an ensuing continuous process of rising prices. “Business requires greater cash holdings, bank loans increase without corresponding deposits, bank reserves, and often bullion reserves, *begin* to fall and the banks are compelled to raise their rates somewhat, though this does not prevent the continuous rise in prices, until the interest rates have reached the level of the normal rate” (Wicksell, 1935[1906], pp. 206-207, italics added). The price level does not return to its original level when the rate of interest approaches the normal rate, which is precisely what gives the process its “cumulative” character.

are carried out by means of transfers in bank accounts. Banks, which are supposed to be connected by a common clearing house, do not demand reserves for domestic cash payments. Nevertheless, since Wicksell is still assuming a gold standard economy, they must maintain a stock of gold in order to meet foreign and industrial demand for gold. "For the sake of simplicity", Wicksell (1936[1898], p. 71) imagines that the whole monetary system of a country is in the hands of a single "Bank". He further assumes that the average value R of the Bank's gold reserve "comprises the property of the bank itself". On this assumption, as far as domestic transactions are concerned, "the Bank's claims on the public must be exactly equal to its debts to the public. If the sum of the credit balances is K , the sum of the debit balances must be K , or rather $-K$; so that the algebraical sum of all balances always remains equal to zero". The stability of money prices under these circumstances, however, does not result from the demand by the non-banking public for gold as store of value, but (assuming a closed economy) from the industrial demand for gold as a commodity, as Wicksell explains on p. 113 of *Interest and Prices*. Assuming that the credit system has been "fully developed in every country", a fortuitous increase of the price level "discourages the production of gold, and, other things being equal, it increases the consumption of gold in industry. As soon as consumption began to outstrip production, the deficiency would have to be supplied out of the banks' stocks, for no other source is allowed for". This long process would eventually prompt banks to raise their interest rates and bring money prices back to their original level. This mechanism was behind Wicksell's criticism of the view - put forward by Adolf Wagner (1862, p. 127) and other supporters of "free banking" - that one could dispense with gold as a means of payment and a reserve of value and base the monetary system on credit alone.

It is sometimes said to be feasible to *base* a monetary system upon gold and yet to dispense entirely, or almost entirely, with the employment of gold both in circulation and in the banks' reserves. This would be done by extending the use of cheques, by the issue of notes of which the cover is of a purely banking nature, and so on. This view, which is held by some of the most prominent writers on monetary questions, must be regarded as utopian. In such a system the value of money would be *directly* exposed to the effects of every fortuitous incident on the side of the production of the precious metals and every caprice on the side of its consumption. It would undergo the same violent fluctuations as do the value of most other commodities. But it would be quite possible to maintain a stable value of money without the use of reserves of a precious

metal. Only would be necessary for the *metal to cease to serve as a standard of value*. (Wicksell, 1936[1898], pp. 34-35; see also p. 46 and Wicksell, 1935[1906], pp. 123-124).

According to Wicksell, the progressive replacement of gold as store of value as the economy converges to a pure credit system would make the price level to behave increasingly as a relative price, since the monetary demand for gold tends to nil. This “contradiction” could only be overcome by “completely divorcing the value of money from metal, or at any rate from its commodity function, by abolishing all free minting, and by making the...unit employed in the accounts of the credit institutions both the medium of exchange and the measure of value” (Wicksell, 1935[1906], p. 126). Nevertheless, still assuming a competitive banking system formed by profit maximizer banks, such a pure credit economy without a material substance as standard of value would feature indetermination of the price level, as Wicksell (1914, pp. 145-6) made clear. Under these circumstances, the equilibrium of general prices “can occur for any level they may have” and “should be constructed on the analogy with the so-called neutral equilibrium in mechanics: it does not change by itself, but nor do any fortuitous changes in it generate forces which would necessarily establish again its previous condition.” What is behind Wicksell’s contention that bank loans increase together with the price level (so that the rate of interest does not move and prices do not come back to their original level) is the implicit assumption that the credit supply function of profit maximizer banks is homogeneous of degree zero in nominal values (cf. Sweeney, 1988, pp. 160-162, 173, 180; see also Hawtrey, 1934[1919], pp. 11-13).

The level of prices in pure credit economies after the monetary reform depicted above is decided entirely by the bank rate of interest, according to Wicksell’s well-known “cumulative process” of price change as a result of the difference between the bank rate and the “normal rate of interest” (that is, the interest rate that equilibrates saving and investment). However, the profit maximizer banks described by Wicksell would have no stimulus to set their interest rates at a level consistent with price stability. Such a monetary policy can be carried out only if a central bank is introduced into the picture.²¹ Assuming there is no outside

²¹ Wicksell (1936[1898], p. 118) pointed out that a pure credit system without a central bank would feature a deflationary tendency, for profit maximizer banks would prefer to set interest

currency in circulation (banknotes, coins, etc.) - and, by that, no opportunity for the central bank to affect through open market policy the interest rate charged by private banks - a public central bank could be introduced as an institution that remunerates its deposits at the same rate charged for its loans (Wicksell, 1917, 1919a). In a competitive banking system, the difference between the rate of interest that is paid on deposits (including current accounts) and the rate charged on loans covers the banks' running costs, the holding of "liquid securities which carry only a moderate of interest", the holding of a stock of metallic money which earns no interest, and, above all, the "trouble and risk involved" (Wicksell, 1936[1898], pp. 139-140). According to Wicksell (1919a), the margin between these two rates far exceeded that amount in the post-war Swedish financial system. This reflected not only the circumstances surrounding the war, but also the natural tendency to "concentration" in the bank business because of economies of scale.²² Wicksell (1919a, p. 185) was aware that if central banks were allowed to remunerate their deposits at the same rate charged for their loans, in principle nobody would be able to lend at a higher rate or to deposit money at a lower rate of interest, which means that there would be no margin of profit for commercial banks. The intermediation of credit would apparently be completely in the hands of the central bank. But, as Wicksell points out, this conclusion is precipitate, since there would still be opportunity for private financial intermediation in areas and sectors of the economy where risk evaluation by the central bank is difficult. Such intermediaries would then be able to charge a rate of interest higher than the central bank's, which becomes the basic rate of the pure credit system (see also 1917, p. 182; cf. 1936[1898], pp. 74-75).²³

rates at a level higher than the natural rate, as "banking activity would *expand relatively* to the level of prices".

²² See Laidler (1992, p. 197), who sustains that "free banking" is inconsistent with the economies of scale that result from the pooling of reserves, as this would prompt unregulated banks to merge into one institution or to centralize their reserve holdings with a central bank.

²³ Wicksell's (1917, 1919a) notion of the pure credit economy as a system with a central bank (that sets the basic rate on deposits) plus specialized intermediaries is remarkably close to Hicks's (1989, chap. 12) "revision" of the pure credit models of *Interest and Prices* and *Lectures* (it should be noted, though, that Hicks completely ignored that Wicksell's models applied most of the time to a gold standard economy). Hicks (p. 104) suggested that a "monocentric" pure credit system would emerge naturally if there was just one central entity whose "promises to pay have superior quality" than those of any other entity. He did not explain, however, why any of the independent private banks in a competitive system should have a better "reputation" (or more confidence) than the others. Alternatively, assuming (as Hicks does) this central entity is a non-private central bank, it remains to explain why such an institution would remunerate deposits, as it would be under no competitive pressure to do so. Cowen & Kroszner's (1994, pp. 144-147) description of Wicksell's pure credit as a system with an "abstract medium of account" *à la* Fama

In April 1917 Wicksell was invited to give a lecture at the Norwegian Economic Association. The topic of his talk was the “Scandinavian Monetary System”, which included a proposal to implement a pure credit economy. Wicksell (1917, p. 184) described the exercise as a “*thought experiment*” (“tankeexperiment”), but at the same time pointed out that it was motivated by the cessation of free minting of gold and of the central bank’s obligation to accept gold at a fixed price in the Scandinavian countries since February 1916. He explained the transition to pure credit using as an example the balance sheet of the central bank of Norway, which is supposed to be, for now, the only bank of the economy. For the sake of illustration, Wicksell (p. 179) imagines that the bank has before the reform assets consisting of gold reserves (100 million krona) and claims (200 million krona), and liabilities in the form of deposits (100 million krona, which also includes the capital of the bank) and notes in circulation (200 million krona). With the permission of the Norwegian parliament, the central bank calls in its notes; half is paid out to note holders in gold and the other half is put down as deposit at the individual’s bank account, on which he or she has the right to draw cheques. Cheques cannot be paid out in cash (gold or notes), but only be transferred to other accounts. At the same time, the bank stops issuing notes and accepting gold as deposit or in payment. The bank’s total assets have now been reduced by 100 million krona (the gold reserves that were given out) and comprise, on one side, claims (200 million krona, as before) and, on the other, deposits (200 million krona, including the bank’s capital). That sum can increase through new loans (which bring about directly or indirectly corresponding deposits in the bank) and can be reduced through payment of debts to the bank. Wicksell acknowledges that at the beginning gold coins would probably be used as means of payment between individuals, but - since they are no longer received by the bank, nor (“let us assume”) held as cash balance - they would soon cease to be used as means of payment and, instead, be melted down and absorbed by industry. In such an economy, “*money means henceforth only the unit in which the bank’s accounts are kept*” (1917, pp. 180-181). Under these circumstances, the only “regulator” of the price level (and of the exchange rate as well against other countries) is the height of the bank’s rate of interest.

One of the main features of pure credit economies is the absence of outside

(1980) in unwarranted and inconsistent with Wicksell’s suggestion on how to render the price

currency. This is true not only of coins, but also of banknotes, which “can be obtained only on payment of interest (or in exchange for commodities), but they earn no interest for their owners. Private individuals are therefore unwilling to stock them in large quantities, and they flow back to the banks in the shape of deposits or are lent to others on return for interest” (Wicksell, 1936[1898], p. 69). Nevertheless, Wicksell (1935[1906], pp. 88-91) was aware that not all payments can be made by cheque and mentioned often that bank notes are “far more convenient” for small payments (see, e.g., 1936[1898], p. 70). More importantly, the use of credit “presupposes a certain amount of confidence” that is lacking in times of “crises”, when the demand for medium of payment turns more to hard cash (see 1935[1906], p. 90; and especially 1902, p. 40).²⁴ Wicksell acknowledged the existence of inconvertible notes issued by a central bank in his more “realistic” scenarios for monetary reform. In this case, the measure of value is the central bank paper money, which is the unit employed in the accounts of the banking system (1935[1906], p. 126), but the bank rate of interest (on deposits and loans alike) is still the key instrument to regulate the amount of notes in circulation and the price level, as in the pure credit economy (see 1917, p. 184; 1919a, pp. 183-185).

5. SOLVAY, WICKSELL AND THE “NEW MONETARY ECONOMICS”

Solvay’s “social comptabilism” and Wicksell’s “pure credit” have many points in common, and yet they never referred directly to one another. Wicksell did notice that the “ideal banking system” (a phrase Wicksell sometimes used to describe the “pure credit economy”) had “in recent times engaged the attention of many writers under the name of ‘universal comptabilism’, and various proposals for its realization have been made” (Wicksell, 1935[1906], p. 87). Both Wicksell and Solvay mentioned the Austrian Post Office Savings Bank as an important illustration of payments by bookkeeping transfers, or the “Giro system”.²⁵

level determinate through the central bank’s interest rate policy.

²⁴ As Hoover (1988, pp. 102-103) pointed out, an important characteristic of financial assets of a developed financial system in a non-Walrasian economy is the “absence of direct connection between the claims represented by the asset and the underlying goods against which it is a claim”, which opens up the possibility of default and reinforces the importance of money as a single good which is generally accepted as settling accounts.

²⁵ Wicksell (1936[1898], p. 68, n. 1; see also 1935[1906], p. 87) referred to the Austrian Post Office Saving Bank as a “quite unique institution” formed by banks that are branches of one

Nevertheless, they drew different conclusions from their respective theoretical constructions, as far as the stabilization of the price level is concerned. While Wicksell stressed bank interest rate policy, Solvay insisted that social comptabilism would make possible the definition of an “abstract unit of account” separated from the medium of exchange, which apparently would be enough to render the price level constant. From that perspective, he was, to a much greater extent than Wicksell, close to the view - put forward in the 1980s by the “New Monetary Economics” - that the key to price level stabilization is the separation of the function of money as the unit of account from its function as the medium of exchange in pure accounting systems of exchange.

Solvay’s distinction between the “comptabilistic system” and the “monetary system” is reminiscent of Eugene Fama’s (1980, p. 42) contrast between “currency type” and “pure accounting” systems of exchange. Solvay characterized the difference as follows:

La conception du système comptabiliste est une conception toute autre que celle du système monétaire. Il n’y a pas la moindre trace de cette seconde conception dans la première; il faut sortir entièrement de l’une pour entrer dans l’autre. En un mot, les deux conceptions s’excluent mutuellement; l’une s’appuie au fond sur l’échange, l’autre sur le *compte*, et les deux systèmes qui en dérivent reposent ainsi sur deux principes d’essence différente.

(...) Il faut préalablement s’habituer à penser et à parler affaires, finances, etc., abstraction faite de toute idée de monnaie, et se persuader que les transactions (...) ne font, en dernière analyse, que modifier les rapports de fortune. (Solvay, 1897b; *NLD*, II, pp. 252-253)²⁶

But, while Fama (pp. 40 and 44) assumes that the numeraire, in terms of which prices are stated in his unregulated banking system, is a real good - and, by that, that the price level is determined as a relative price in the general equilibrium solution of a non-monetary economy - Solvay suggested that the definition of an abstract unit of account involves the setting of the “initial value” of an arbitrary good at a given moment (e.g. the value of one ounce of gold at time 0) as unity.

single monetary institution serving the whole country. See Cowen & Kroszner (1994, p. 144) for references to the “Giro system” used in continental Europe at the time.

²⁶ Cf. Fama (1980, p. 42): “Consider a transaction in which wealth is to be transferred from one economic unit to another. In a currency type system, each transaction in this resettling of wealth involves the intervention of a physical medium of exchange which serves as a temporary abode of purchasing power. (...) In contrast, in a pure accounting system of exchange, the notion of a physical medium or temporary abode of purchasing power disappears. Its role in the transactions sequence is replaced by bookkeeping entries, that is, debits and credits to the deposits of the economic units involved.” In Fama’s world, bank liabilities are not redeemable claims to outside

Solvay claimed that such an invariable numéraire would be superior to a variable one (e.g. taking as unit of value at time t the value of one ounce of gold at time t , which is the usual Walrasian concept of numéraire adopted by Fama and others), and that it would be able by itself to produce price stability in terms of comptabilist units (the “franc”).

On the issue of the invariable unit of value there is a striking resemblance between the work of Solvay and that of his contemporary Arthur Kitson. This was already noticed by two of Solvay’s close collaborators at the *Institut des Sciences Sociales*. Not only De Greef (1899, pp. 35, 94, 127, 129), but especially Denis (1901) drew attention to the similarity between the monetary ideas of Solvay and those of Kitson. Denis wrote an extensive study of Kitson’s (1895a) book, and although he never said so explicitly, it might well be that he was more impressed by Kitson’s arguments than by Solvay’s.²⁷ More recently, the interpretation of Kitson (1895b) by Cowen & Kroszner perhaps applies even better to Solvay:

An abstract medium of account can be defined by setting the value of any commodity on a given day equal to “one” and pricing all commodities in terms thereof. For all succeeding market periods, however, this link is severed and only the abstract medium remains. Market participants set prices (in terms of abstract media) by reference to the abstract medium-denominated prices of the preceding period. The abstract medium is derived from a sequential process which ultimately refers back to an original commodity value. (Cowen & Kroszner, 1994, p. 126)

However, as Scott Sumner pointed out critically in connection with this interpretation of Kitson, it is not enough to define the unit as the value of X ounces of gold on a given moment:

The unit can be defined as the value of X ounces of gold on a given day, but to insure price stability it must also be defined in terms of a given basket of commodities (as in the Greenfield-Yeager system). Otherwise, linking of the unit of account to the value of gold on a given day merely provides the unit with the *appearance* of having intrinsic value. (Sumner, 1990, p. 114).

currency, but are on the order of shares in a mutual fund’s portfolio of interest-bearing assets. Convertibility is also absent from Solvay’s social comptabilism.

²⁷ Denis (1901, p. 125) was well aware of both the similarities and the differences between the two approaches: “On est frappé du rapprochement qui existe entre cette conception monétaire de M. Kitson et la conception comptabiliste de M. E. Solvay. Par des voies différentes, au même moment, deux hommes vigoureusement doués de la puissance d’abstraire en viennent à concevoir une forme définitive de la monnaie qui ne sera plus richesse, mais le signe, le symbole des richesses, qui, perdant définitivement son caractère matériel, apparaîtra comme une monnaie idéale, *an ideal money, a symbolical money*, suivant les expressions de James Steuart dès le XVIII^e siècle.”

Nevertheless, it should be noted that, contrary to the readings of Cowen & Kroszner and of Sumner, Kitson did define the unit of account in terms of a bundle of commodities in his 1895 article in *Liberty*, if not in his book. He made it clear that “by the terms of the problem, the purchasing power of 1 ounce of gold represents our unit of purchasing power” and explained:

If we divide the total wealth of a community into any arbitrary number of equal parts, and if there be no additions or diminutions of wealth, no matter what fluctuations may occur in exchanges, the number of units of value of each unit must remain constant. When I speak of dividing the wealth, I mean in *equal exchange proportions* at a given time. The purchasing power of the wealth of any community may always be regarded as an even multiple of the purchasing power of a single commodity, such as 1 bushel of wheat, 1 ounce of silver. (...) Suppose we divide it into so many equal portions, and each portion is the exchange equivalent of 1 ounce of gold at a particular time. The total wealth would then represent a certain number of such unities or fractions of such unities. No matter how gold might fluctuate thereafter, such unities would remain invariable - i.e., they would be invariable fractions of the total wealth expressed in terms of the purchasing power of gold at that particular time (Kitson, 1895b, pp. 6-7).

The precise nature of Kitson’s suggested unit of account was well understood by one of his critics, Hugo Bilgram, who concluded that “Mr. Kitson is, after all, advocating a concrete unit of purchasing power, - viz., a composite unit agreeing in composition with that of the sum of all wealth.” Bilgram then wondered how Kitson proposes “to produce notes that shall be representative of such unities”, as the only method known would be to make the notes “a valid claim against the issuer for the delivery of the list of things” composing the wealth selected as the unit (Bilgram, 1895, p. 2).²⁸ As we shall see below in connection with Wicksell, the modern “New Monetary Economics” literature has claimed that “indirect convertibility” can tackle the problems associated with systems of convertibility based on commodity baskets, of the kind raised by Bilgram.

In contrast with Kitson (and with Greenfield & Yeager, 1983), Solvay did not state clearly that his proposed abstract unit of account should be defined by a bundle of commodities with a fixed price of 1 unit. Solvay’s ambiguity on this crucial aspect of his plan for monetary reform may explain the hard time that commentators had when trying to make sense of his “abstract unit” (see Walras,

²⁸ Kitson supported “free banking”, with banknotes issued competitively by private banks, which is quite different from Solvay’s social comptabilism.

1898). Achille Loria (1902, p. 120) pointed out that the measure of value in Solvay's system "est fixée au moyen de la détermination préalable de la valeur d'une marchandise donnée à un moment déterminé. Mais cette valeur initiale, en quoi est-elle exprimée?" Instead of purchasing power in terms of a given basket of commodities *à la* Kitson, Loria suggested that the "initial value" of the commodity should be measured in labour time. Other commentators, like Pareto (1965[1903], pp. 280-84), simply omitted any reference to the abstract unit of account and focused instead on Solvay's emphasis that the creation of credit in the comptabilistic system should be entirely based on the commodities given as a pledge. Solvay (1897b; *NLD*, II, p. 256) maintained that in the comptabilistic system, "l'individu affilié ne fait pas un dépôt d'unités monétaires ayant une valeur par elles-mêmes, il donne en gage un bien et, d'après la valeur de ce bien, on lui permet de transactionner avec plus ou moins d'unités". Solvay (1896; *NLD*, II, pp. 239-40) admitted in principle the possibility of excess demand for comptabilist units with an ensuing fall of the price level, but insisted that if social comptabilism worked according to the credit creation rules stated above "il est infiniment peu probable que la contraction puisse se produire et ce n'est pas un des moindres avantages du système" (Solvay, 1898a; *NLD*, II, p. 266). He also invoked implicitly the well-known "law of reflux" of the English Banking School in support of his view that any excess supply of comptabilist units would return to the bank, without any effects on the price level. Pareto criticized the "real bills doctrine" assumed by Solvay, on the familiar grounds that the nominal value of the assets given as pledge depends itself on the expansion of loans and the price increase process. It should be noted, however, that Solvay suggested that the value of each individual's assets should be measured by the "initial value" of the abstract unit of account, which supposedly would fix the supply of comptabilist units and render the price level determinate. But Solvay's ambiguity about the abstract unit prevents an exact assessment of his views on the credit mechanism.²⁹

In contrast with Solvay and the "New Monetary Economics", the unit of

²⁹ As explained by Selgin (1989, pp. 497-498), the "real bills doctrine" maintains that banking merely involves a substitution of one variety of assets for another, more negotiable variety of equivalent value, without affecting new intertemporal exchanges, in contrast with the "intermediary view" of commercial banking held by Wicksell and many others. Social comptabilism is quite consistent with the "real bills" view: "Thus the primary service of commercial banks is not lending but 'making sure that individuals may safely transfer value to others'. The banks function like a clearing house, 'offsetting' commercial debts so that

account in which bank accounts are kept in Wicksell's pure credit economy (after monetary reform and assuming away outside currency) is not "abstract" or "separated" from the medium of exchange in the sense that the nominal value of exchange media is not fixed in terms of the unit of account. This is behind the crucial role of bank rate policy in Wicksell's proposal to stabilize the price level. But Wicksell also discussed critically other plans designed to eliminate or diminish price level fluctuations, which are closer to the general framework of the "New Monetary Economics": Irving Fisher's (1913, chap. xiii) famous "compensated dollar plan" and especially Benjamin Anderson's (1917) suggestion that it would be feasible, by means of "indirect convertibility", to use as the standard of value a commodity that is not itself either the medium of exchange or the medium of redemption of notes and deposits.

Fisher (1913) assumes a gold standard economy where all gold coin has been replaced by gold certificates which can be redeemed upon demand from the government for a certain quantity of gold bullion, but with a variable seignorage, determined according with changes in the price level: if the price level increases by, say, 1 percent, then the purchasing power of a dollar gold-certificate would be restored by increasing the "gold content" of a dollar by 1 percent, which means to decrease the dollar price of a given quantity of gold. This way, Fisher claimed that any change in the gold price of the basket of commodities that defines the price index can be compensated by an appropriate change in the dollar price of gold, thereby keeping the dollar price of the basket constant (see Patinkin, 1993). Wicksell (1913; 1935, pp. 225-8) discussed Fisher's plan in detail. He pointed out that the plan assumes that the exchange value of the metallic gold in terms of goods is not affected by the seignorage, an assumption that is valid only for an individual country. But, in this case, the country's metallic gold would flow to other countries where it could be minted without seignorage, that is, changing the dollar price of gold actually meant changing the foreign exchange rate. If all countries should adopt the same plan, the effect of the seignorage on the exchange value of metallic gold would constitute a hindrance to the planned increase of the purchasing power of gold. Wicksell further argued that a change of the mint price can only influence directly the production flow of new gold, which is a small fraction of the total stock of money and that thereby the impact of Fisher's plan

intermediate goods can be traded among stages of production without there being any 'double

on the price level would be close to nil (1913, pp. 135-7; 1935, pp. 226-7; see also Patinkin, 1993, pp. 7-9 and 10-11). Wicksell (1935, p. 228) noticed that Fisher's plan involved a separation between the medium of exchange and the unit of account, as "the very substance of (Fisher's) proposed reform is to raise something *else* to the position of a *measure of value*, and not gold as is now the case." And asked: "Why not, therefore, go the whole way, and choose something different by which the goal in view, a stable price level, may be secured with reasonable certainty?" His answer (1913, p. 138) was the replacement of gold as standard of value for banknotes, or, more generally, the unit in which bank accounts are kept, and its stabilization through bank rate policy.³⁰

Wicksell's (1919b) criticism of B. Anderson (1917) has attracted attention recently in connection with the suggestion of Greenfield & Yeager (1989, p. 410) that prices should be quoted in terms of bank-issued exchange media convertible into some medium of redemption (such as gold) "actually worth, at prevailing market prices, as many standard bundles as the Unit denominations of the banknotes and deposits being redeemed". This way, the medium of exchange would be "indirectly convertible" into the commodity bundle that defines the unit of account. As Wicksell pointed out, however, in his comments on a similar proposal by Anderson (1917, pp. 150-51), indirectly convertible systems suffers from a "paradox of indirect convertibility" that would prevent their practical implementation (see Trautwein, 1993, pp. 103-4; Dowd, 1995, pp. 76-8): if the price of the unit of account (the commodity bundle in Greenfield & Yeager, or 23.22 grains of gold in Anderson) should diverge from unity, then self-reinforcing movements in the price of the redemption medium (silver in Anderson's illustration) might destroy the indirectly convertible system. Anderson, as part of his argument against the quantity theory of money, imagines a "hypothetical case" in which the value of money would be entirely decided by the value of the commodity chosen as the standard of value, so that the "value of money would

coincidence of wants' or resort to cash exchange" (p. 497). Cf. Cowen & Kroszner (1994, p. 118).
³⁰ As pointed out by Patinkin (1993, pp. 16-17), Fisher (1920, pp. 129-131) introduced a major modification in his 1913 plan, that is, he added a "definitive-reserve system" in which changes in the price gold also revalue the existing monetary stock of gold and, by that, bring about changes in the quantity of gold certificated that can be issued. According to Fisher, this would increase the speed of the plan, but, as shown by Patinkin, that change marks the start of Fisher's movement away from the compensated dollar, until eventually he gave it up in the mid 1930s. In any event, despite similarities with the "New Monetary Economics", Fisher's compensated dollar did not really "separate" the unit of account from the redemption medium, since the dollar was legally defined as a certain amount of gold (see also Patinkin, 1996).

control the quantity of money”, instead of the other way around. He assumes that the standard of value is defined as 23.22 grains of pure gold, but that no gold is coined and that the medium of exchange consists of paper money redeemable not in gold, but in silver at the market ratio of silver to gold. In this case, the amount of silver in which paper is redeemable is variable, but always just enough to procure 23.22 grains of gold. There would be no monetary demand for the standard of value, only non-monetary demand as a commodity. Anderson claims that in this situation “the value of the paper money would be tied absolutely to the value of gold. (...) The quantity of gold [and silver as well] would be absolutely irrelevant as affecting its value”. A higher value of money (lower price level) would reduce the transactional demand for paper money, which would be sent for redemption.

Wicksell (1919b, pp. 59-62) starts his assessment of Anderson’s thesis by assuming that the value of gold and silver are regulated by their respective production costs and that the market prices are 1 dollar per unit of weight of gold (23.22 grains) and 5 c. per unit of silver (1 dollar for 20 units), which means that, according to Anderson’s framework, the government buys and sells silver at a price of 1 (paper) dollar for 20 units of weight. If the cost of production should, say, double, then the immediate market price of a unit of gold would be 2 dollars (40 units of silver). In order to try to keep its notes at parity with gold, the government would now buy and sell silver at a price of 1 dollar for 40 units of silver. However, this would interrupt the production of silver, while the production of gold would continue as before, but, because of the higher costs, a unit of gold would fetch in the market 2 dollars, which means that its price in silver will now be 80 units of silver. The government will then have to increase the redemption price for its notes to 80 units of silver for 1 dollar, but then a unit of gold will fetch in the market 160 units of silver, and so forth, with the price of silver in the process falling in the limit toward zero because of the initial change in the relative price of gold. Wicksell concluded that indirectly convertible systems would feature the “seeming paradox” that a rise in the price of the standard of value leads to a collapse in the price of the medium of redemption. Accordingly, a “separation” of the unit of account and the medium of exchange

does not provide a key to price level stabilization.³¹

6. CONCLUDING REMARKS

One of the main factors behind the “New Monetary Economics” laissez-faire approach to monetary stability is the attempt to prevent the monetary pressures on the value of the unit of account which are supposed to be a feature of the current fiat money standard (and of ordinary commodity standards as well, for that matter). This would be achieved though the definition of the unit of account not in terms of any medium of exchange whose value depends on its quantity, but in terms of a commodity bundle, while the media of exchange would be supplied competitively by a banking and financial system unregulated by the government (see, e.g., Greenfield & Yeager, 1983; Cowen & Kroszner, 1994, chap. 3). On the other hand, we saw above that, according to Wicksell, a competitive payment system using as unit of account the same unit in which bank accounts are kept would render the price level unstable in “neutral equilibrium” and that, furthermore, the definition of a unit of account separated from and indirectly convertible into the medium of exchange would feature the “paradox of indirect convertibility”. Solvay’s ideas on monetary reform experiments are closer to modern “New Monetary Economics” in principle, but his proposal did not include laissez-faire banking. One might even say that Solvay’s social comptabilism was of an extremely centralist character:

A un véritable anarchisme économique des individus agissant au sein de la Société chacun pour leur propre compte, séparément, distinctement, dans toutes les directions, il substitue l’unité d’action, la concentration, la suprême organisation sociale et, par conséquent, la simplification et l’économie. La Société, prise dans son ensemble, (...) devient bien ainsi un véritable organisme perfectionné à l’extrême, renfermant le minimum de rouages, d’organes et de mouvements particuliers et capable, par suite, du maximum d’effet utile, épargnant à chaque homme le maximum de temps, lui accordant le maximum de loisir, lui laissant son entière initiative productiviste et la favorisant, réglant enfin toutes questions d’une façon nette et impeccable. (Solvay, 1900d; *NLD*, II, p. 278)

Solvay stressed that, in social comptabilism, all transactions would be legally

³¹ The paradox was independently rediscovered by Schnadt & Whittaker (1993). See also Dowd’s (1995, pp. 78-81) attempt to establish conditions that could prevent the paradox and render indirect convertibility feasible.

guaranteed by the State. This would be the result of the fact that the State would make sure that no person received more comptabilistic units than the value of his or her possessions: “jamais le comptable ne délivrera un nombre d’unités supérieur à la valeur courante du gage” (Solvay, 1900c; *NLD*, II, p. 271). Economic transactions would become completely separated from any form of exchange:

Le compte social doit être considéré comme une véritable *caisse authentique* tenue par l’Etat au profit de chaque particulier, *double de la caisse privée de chacun*, dans laquelle il n’entre et il ne sort que des unités extincatoires purement abstraites représentées par des chiffres et ne possédant plus aucun attribut qui permette de laisser concevoir un échange. (*ibid.*, pp. 271-272)

As we saw above, the scenario considered to be more likely by Wicksell is a developed credit economy formed by private banks that lend money for risky projects plus a central bank that remunerates deposits at the same rate charged for its loans and issues inconvertible banknotes used as outside currency and unit of account. Outside currency is also assumed by Fama (1980, pp. 49-51) in the final sections of his article, but, in contrast with Fama’s notion (based on the application of the Modigliani-Miller theorem to banks) that the control of the supply of currency alone is sufficient to render the price level determinate, Wicksell put emphasis on the control of aggregate demand through bank rate policy. Furthermore, Wicksell did not share the widespread opinion that systems with fiat paper money as unit of account are intrinsically unstable, illustrated by Fisher’s (1913, p. 252) statement that “although theoretically irredeemable paper money may be the cheapest and most easily regulated form of currency (...) the lesson of history is emphatically that irredeemable paper money results in monetary manipulation, business distrust (...) and all the evils which flow from these conditions”. According to Wicksell (1935[1906], pp. 165-68 and p. 153 on the French *assignats*), monetary history shows that “disguised taxation in the form of inconvertible gradually depreciated paper money” is generally associated with war time and political instability, not a normal feature of paper currency systems. In the same vein, he disputed the view (cf. Fama, 1983, p. 18) that the value of fiat money is based on the taxing authority of the government:

It cannot be denied that the adoption of a legally enforced rate, the acceptance of notes in payment of taxes, etc., assist in maintaining the value of a paper currency. (...) But there is no reason, I think, for regarding them as the sole, or

indeed as the predominant influence.

Let us now suppose that first of all paper is made irredeemable and that then free coinage is suspended. (...) It may at first seem paradoxical that “worthless scraps of paper” can possess a value in themselves. The explanation is simple: these particular scraps of paper, furnished with a certain form of inscription, may not be manufactured or drawn up by anybody; it is essential to have some means of exchange...and no other is available. Consequently the “scraps of paper” are accepted at the price at which they are obtainable (Wicksell, 1936[1898], p. 48).

Wicksell’s notion of fiat money as base money and medium of exchange differentiates his approach from the “legal restriction theory” (see Wallace, 1983) of the demand for money. Wallace explains the existence of non-interest bearing, intrinsically valueless store of value (such as fiat money) by the legal requirements of the State, in contrast with unregulated markets, where non-fiat money, in the form of claims over utility-yielding goods, is the only money viable. For Wicksell, on the other hand, money is not just a store of value, but also a medium of exchange and unit of account in existing economies with transaction costs, which explains the survival of non-interest bearing currency (see also Laidler, 1987).

The respective fates of Solvay’s social comptabilism and Wicksell’s pure credit have been quite different, as far economic theory is concerned. Wicksell’s construction has been used as a benchmark in monetary economics by authors such as Mises, Lindahl, Hicks and Patinkin, among others (see Trautwein, 1995), while Solvay’s concept has remained largely unknown to the profession (or strongly criticized whenever mentioned, as witnessed by Rist’s (1938) reference to the “Solvay School”). This is well illustrated by Mises’s classic *Theory of Money and Credit*, which refers to Solvay and to Wicksell in connection with social comptabilism and pure credit. Mises (1980[1912], p. 112) labelled Solvay a “money crank” who thought that an elastic credit system automatically adapted to the need for currency is “the cure to all human ills”. Mises (like Pareto before him) suggested that Solvay’s theory was an application of the monetary views of the English “Banking School” of Tooke and Fullarton, and maintained that “the rejection of schemes such as Ernest Solvay’s ‘social comptabilism’ is to be attributed solely to the practical man’s timidity and not to any strict proof of the weakness of the schemes, which has indeed not been forthcoming”. But, despite writing that “Solvay’s theories also contain various other fundamental errors”, Mises did not come back to that in the rest of his book and did not provide any

“strict proof” of the weakness of social comptabilism, other than a general criticism of the Banking School. Mises’s (pp. 394-395) reference to Wicksell’s “hypothetical bank” in a pure credit economy was, on the other hand, accompanied by a detailed examination of the “limits” to the creation of credit by the banking system in these circumstances, which became part and parcel of his explanation of the upper turning point of the business cycle (and was, by the way, rejected by Wicksell; see Boianovsky, 1995, section 5). Being primarily a building block of his controversial proposal of a monetary reform experiment, Solvay’s case for social comptabilism was not developed from a careful study of the determinants of the demand for money and its relation with the aggregate demand for goods, which was precisely what caught the profession’s attention in Wicksell’s approach to “pure credit”. Economic legislators did not carry out the experiment Wicksell described in 1917, but, since the abandonment of the gold standard, monetary systems have gradually become increasingly similar to his “pure credit economy” (see, e.g., Hicks, 1989; Leijonhufvud, 1997). In the same vein, Solvay did not succeed in carrying out the social comptabilism experiment in Belgium, despite his propagandistic effort. Nevertheless, his notion of an abstract unit of account is back in the research agenda of monetary economics.

References

- ANDERSON, B.Jr. (1917), *The Value of Money*, New York: Macmillan.
- AUCUY, M. (1908), *Les Systèmes Socialistes d'Échange*, Paris: Félix Alcan.
- BAUDIN, L. (1947), *La Monnaie et la Formation des Prix* (2ième édition), Paris: Recueil Sirey.
- BILGRAM, H. (1895), "A standard after all", *Liberty*, June, vol. 15: 2-3.
- BLACK, F. (1987[1970]), "Banking and interest rate in a world without money", in: F. Black, *Business Cycles and Equilibrium*, Oxford: Basil Blackwell, 1-20.
- BLAUG, M. (1980), *The Methodology of Economics*, Cambridge: Cambridge University Press.
- BOIANOVSKY, M. (1995), "Wicksell's business cycle", *European Journal of the History of Economic Thought*, vol. 2(2): 375-411.
- BOIANOVSKY, M. (1998), "Real balances, the price level and the unit of account: from Wicksell to Patinkin and beyond", *American Journal of Economics and Sociology*, vol. 57(4): 579-612.
- BOURGUIN, M. (1913), *Les Systèmes Socialistes et l'Évolution Économique*, Paris: Librairie Armand Colin.
- COHN, A.W. (1920), *Kann das Geld Abgeschafft Werden?*, Jena: Gustav Fischer.
- COWEN, T. & R. KROSZNER (1994), *Explorations in the New Monetary Economics*, Oxford: Blackwell.
- CROMBOIS, J.-F. (1994), *L'Univers de la Sociologie en Belgique de 1900 à 1940*, Bruxelles: Éditions de l'Université de Bruxelles.
- DE GREEF, G. (1899), *Le Crédit Commercial et la Banque Nationale de Belgique*, Bruxelles: O. Mayolez & J. Audiarte.
- DEJONGH, Ch. & E. HANSSENS (1901), *Procès Verbal*, Bruxelles.
- DENIS, H. (1898), "La critique du comptabilisme par M. Walras et les formules de la valeur de la monnaie", *Annales de l'Institut des Sciences Sociales*, vol. 4(4): 275-289.
- DENIS, H. (1901), *Les Théories de la Valeur et les Conceptions du Système Monétaire. IVe Étude. A. Kitson* [Extrait des *Annales de l'Institut des Sciences Sociales*], Bruxelles: Institut des Sciences Sociales.
- DONY-HÉNAULT, O. (1942), "Ernest Solvay, pionnier des sciences expérimentales", *Académie Royale de Belgique. Bulletin de la Classe des Sciences*, 5e série, vol. 28(12): 927-967.

- DOWD, K. (1995), "The mechanics of indirect convertibility", *Journal of Money, Credit and Banking*, vol. 27(1): 67-88.
- EDGEWORTH, F.Y. (1888), "The mathematical theory of banking", *Journal of the Royal Statistical Society*, March, vol. 51: 113-126.
- ELKHADEM, H. & Th. MAYER (1997), "La soude, une histoire ancienne et moderne" in: A. Despy-Meyer & D. Devriese (Eds.), *Ernest Solvay et son Temps*, Bruxelles: Archives de l'Université Libre de Bruxelles, 137-147.
- ERREYGERS, G. (1998), "The economic theories and social reform proposals of Ernest Solvay (1838-1922)" in: W.J. Samuels (Ed.), *European Economists of the Early 20th Century, Volume 1. Studies of Neglected Thinkers of Belgium, France, The Netherlands and Scandinavia*, Cheltenham: Edward Elgar, 220-262.
- FAMA, E. (1980), "Banking in the theory of finance", *Journal of Monetary Economics*, vol. 6(1): 39-57.
- FAMA, E. (1983), "Financial intermediation and price level control", *Journal of Monetary Economics*, vol. 12(1): 7-28.
- FISHER, I. (1913), *The Purchasing Power of Money* (revised edition), New York: Macmillan.
- FISHER, I. (1920), *Stabilizing the Dollar*, New York: Macmillan.
- GIDE, Ch. (1897), "Lettre de M. le Professeur Charles Gide [Au sujet du comptabilisme]", *Annales de l'Institut des Sciences Sociales*, vol. 3(4): 220.
- GIDE, Ch. & Ch. RIST (1915), *A History of Economic Doctrines from the Time of the Physiocrats to the Present Day*, London: George G. Harrap & Co.
- GREENFIELD, R. & L. YEAGER (1983), "A laissez-faire approach to monetary stability", *Journal of Money, Credit and Banking*, vol. 15(3): 302-315.
- GREENFIELD, R. & L. YEAGER (1989), "Can monetary disequilibrium be eliminated?", *Cato Journal*, vol. 9(2): 405-421.
- HAWTREY, R.G. (1934[1919]), *Currency and Credit* (3rd edition), London: Longmans, Green.
- HÉGER, P. & Ch. LEFÉBURE (1929), *Vie d'Ernest Solvay*, Bruxelles: Libraire Lamertin.
- HENRIKSSON, R. (1991), "The facts on Wicksell on the facts: Wicksell and economic history", *Research in Economic History*, vol. 6(supplement): 33-50.
- HICKS, J. (1989), *A Market Theory of Money*, Oxford: Clarendon Press.

- HOOVER, K.D. (1988) *The New Classical Macroeconomics*, Oxford: Blackwell.
- HUTCHISON, T.W. (1953), *A Review of Economic Doctrines: 1870-1929*, Oxford: Oxford University Press.
- INGRAM, J.K. (1897), “Lettre de M. John K. Ingram, Professeur à Dublin [Au sujet du comptabilisme]”, *Annales de l’Institut des Sciences Sociales*, vol. 3(5): 311-312.
- JAFFÉ, W. (Ed.) (1965), *Correspondence of Léon Walras and Related Papers*, Amsterdam: North Holland.
- JEVONS, W.S. (1883), *Methods of Social Reform*, London: Macmillan.
- KEYNES, J.N. (1973[1890]), *The Scope and Method of Political Economy*, Clifton: A. M. Kelley.
- KITSON, A. (1895a), *A Scientific Solution to the Money Question*, Boston: Arena.
- KITSON, A. (1895b), “Mr. Kitson’s defence”, *Liberty*, June, vol. 15: 6-8.
- LAILLER, D. (1987), “Wicksell and Fisher on the ‘backing’ of money and the quantity theory”, in: K. Brunner & A. Meltzer (Eds.), *Carnegie-Rochester Conference Series on Public Policy*, vol. 27, Amsterdam: North-Holland, 325-334.
- LAILLER, D. (1991), *The Golden Age of the Quantity Theory*, New York: Philip Allan.
- LAILLER, D. (1992), “Free banking: theory”, in J. Eatwell et al. (Eds.), *The New Palgrave Dictionary of Money and Finance*, vol. 2, London: Macmillan, .
- LANGELÜTKE, H. (1925), *Tauschbank und Schwundgeld als Wege zur Zinslosen Wirtschaft. Vergleichende Darstellung und Kritik der Zirkulationsreformen P.J. Proudhons und Silvio Gesells*, Jena: Gustav Fischer.
- LEIJONHUFVUD, A. (1997), “The Wicksellian heritage”, *Economic Notes*, vol. 26(1): 1-10.
- LORENTZ, H.-A. & E. HERZEN (1923), “Les rapports de l’énergie et de la masse, d’après Ernest Solvay”, *Comptes Rendus des Séances de l’Académie des Sciences*, vol. 177; in: *NLD*, I, 273-283.
- LORIA, A. (1902), “Des méthodes proposées pour régulariser la valeur de la monnaie”, *Revue d’Economie Politique*, vol. 16(2): 109-124.
- LUCION, R. & A. BRICHAUX (1924), “Expériences entreprises par Ernest Solvay de 1877 à 1881 sur l’unité fondamentale de la matière et de l’énergie”,

- Bulletin de la Classe des Sciences de l'Académie de Belgique*; in: *NLD*, I, 285-294.
- MAY, D. (1896), "L'Institut Solvay et le 'Comptabilisme'", *Revue Politique et Parlementaire*, vol. 7(23): 385-397.
- MILL, J.S. (1992[1844]), *Essays on Some Unsettled Questions of Political Economy*, Bristol: Thoemmes Press.
- von MISES, L. (1980[1912]), *The Theory of Money and Credit*, Indianapolis: Liberty Press.
- OTLET, P. (1898) "Observations à propos de la note de M. Solvay relative au comptabilisme", *Annales de l'Institut des Sciences Sociales*, vol. 4(4): 290-294.
- PARETO, V. (1965[1903]), *Les Systèmes Socialistes*, vol. II, in: G. Busino (Ed.), *Vilfredo Pareto, Œuvres Complètes*, Genève: Librairie Droz, vol. 5.
- PATINKIN, D. (1965), *Money, Interest and Prices* (2nd edition), New York: Harper and Row.
- PATINKIN, D. (1993), "Irving Fisher and his compensated dollar plan", *Federal Reserve Bank of Richmond Economic Quarterly*, vol. 79(3): 1-33.
- PATINKIN, D. (1996), "Indirect convertibility and Irving Fisher's compensated dollar", *Journal of Money, Credit and Banking*, vol. 28(1): 130-131.
- POUDOU, F. (1919), *Les Procédés Amétalliques de Paiement et le Chèque Postal*, Paris: Librairie d'Enseignement Technique.
- RIST, Ch. (1938), *Histoire des Doctrines Relatives au Crédit et à la Monnaie depuis John Law jusqu'à nos Jours*, Paris: Recueil Sirey.
- ROCHE-AGUSSOL, M. (1903), *Essai sur le Clearing System*, Thèse pour le Doctorat ès-Sciences Economiques, Montpellier: Imprimerie G. Firmin, Montane et Sicardi.
- SCHNADT, N. & J. WHITTAKER (1993), "Inflation-proof currency? The feasibility of variable commodity standards", *Journal of Money, Credit and Banking*, vol. 25(2): 214-221.
- SCHUMPETER, J. (1917-1918), "Das Sozialprodukt und die Rechenpfennige. Glossen und Beiträge zur Geldtheorie von heute", *Archiv für Sozialwissenschaft und Sozialpolitik*, vol. 44: 627-715.
- SELGIN, G. (1989), "The analytical framework of the real bills doctrine", *Journal of Institutional and Theoretical Economics*, vol. 145(3): 489-507.

- SELGIN, G. & L. WHITE (1994), "How would the invisible hand handle money?", *Journal of Economic Literature*, vol. 32(4): 1718-1749.
- SOLVAY, E. (1871), "Lettre d'un inconnu"; in: *NLD*, II, 9-10.
- SOLVAY, E. (1894a), "Discours au Sénat. Séance du 24 Mai 1894", *Annales Parlementaires*; in: *NLD*, II, 62-69.
- SOLVAY, E. (1894b), "Le programme de l'Institut des Sciences Sociales. Avant-propos", *Annales de l'Institut des Sciences Sociales*, vol. 1(1): 1-3.
- SOLVAY, E. (1894c), "Comptabilisme et proportionnalisme social", *Annales de l'Institut des Sciences Sociales*, vol. 1(1): 4-26.
- SOLVAY, E. (1895), *Gravitique*; in: *NLD*, I, 9-113.
- SOLVAY, E. (1896), "Principe et raison d'être du comptabilisme social", *Annales de l'Institut des Sciences Sociales*, 2(5); in: *NLD*, II, 229-249.
- SOLVAY, E. (1897a), "Social comptabilism. Its principle and ground of existence", in: *Social Comptabilism*, Bruxelles: Institut des Sciences Sociales, 1-17.
- SOLVAY, E. (1897b), "Le comptabilisme social (note complémentaire)", *Annales de l'Institut des Sciences Sociales*, vol. 3(1); in: *NLD*, II, 251-256.
- SOLVAY, E. (1898a), "Comptabilisme et fixité de l'unité de la valeur abstraite", *Annales de l'Institut des Sciences Sociales*, vol. 4(4); in: *NLD*, II, 257-267.
- SOLVAY, E. (1898b), "Le productivisme social", *Annales de l'Institut des Sciences Sociales*, vol. 4(5); in: *NLD*, II, 207-227.
- SOLVAY, E. (1899a), "La monnaie et le compte", *Annales de l'Institut des Sciences Sociales*, vol. 5(2); in: *NPC*, 83-91.
- SOLVAY, E. (1899b), "La monnaie et le compte (note complémentaire)", *Annales de l'Institut des Sciences Sociales*, vol. 5(3); in: *NPC*, 93-101.
- SOLVAY, E. (1899c), "La monnaie et le compte (seconde note complémentaire)", *Annales de l'Institut des Sciences Sociales*, vol. 5(4); in: *NPC*, 103-124.
- SOLVAY, E. (1900a), "Discussion du projet de loi prorogeant la durée de la Banque Nationale", *Annales Parlementaires*; in: *NLD*, II, 112-123.
- SOLVAY, E. (1900b), *Études Sociales. Notes sur le Productivisme et le Comptabilisme [NPC]*, Bruxelles: Henri Lamertin.
- SOLVAY, E. (1900c), "La notion de l'échange, la notion du compte social et la notion du droit social", *Annales de l'Institut des Sciences Sociales*, vol. 6(2);

- in: *NLD*, II, 269-273.
- SOLVAY, E. (1900d), “La théorie des échanges et la notion du productivisme social”, *Annales de l’Institut des Sciences Sociales*, vol. 6(3); in: *NLD*, II, 275-279.
- SOLVAY, E. (1911a), “Allocutions relatives à la gravito-matérialitique prononcées à l’ouverture et à la clôture du ‘Conseil de Physique’ tenu à Bruxelles du 29 Octobre au 3 Novembre”; in: *NLD*, I, 115-121.
- SOLVAY, E. (1911b), *Sur l’Établissement des Principes Fondamentaux de la Gravito-Matérialitique*, Bruxelles: Imprimerie Bothy.
- SOLVAY, E. (1912), “Contribution à l’étude de la constitution de la matière, de l’éther et de l’énergie”, *Bulletin de la Société Chimique de Belgique*; in: *NLD*, I, 259-275.
- SOLVAY, E. (1929), *Notes, Lettres et Discours d’Ernest Solvay [NLD]*, Bruxelles: Lamertin.
- SOLVAY, E. & R. LUCION (1877), “Remarques sur l’action d’acides anhydres stables sur des bases anhydres stables: explosion du composé”, *Comptes Rendus de l’Académie des Sciences de Paris*, vol. 85: 1160-1168.
- STENGERS, I. (1997), “La pensée d’Ernest Solvay et la science de son temps”, in: A. Despy-Meyer & D. Devriese (Eds.), *Ernest Solvay et son Temps*, Bruxelles: Archives de l’Université Libre de Bruxelles, 149-165.
- SUMNER, S. (1990), “The forerunners of ‘New Monetary Economics’ proposals to stabilize the unit of account”, *Journal of Money, Credit and Banking*, vol. 22(1): 109-18.
- SWEENEY, R. (1988), *Wealth Effects in Monetary Theory*, Oxford: Basil Blackwell.
- TASSEL, É. (1920), *Notes sur les Travaux Poursuivis par Ernest Solvay de 1857 à 1914*, Ixelles: Imprimerie G. Bothy.
- TRAUTWEIN, H.-M. (1993), “Preisniveaustabilität durch indirekte Konvertibilität?”, in: H.-J. Stadermann & O. Steiger (Eds): *Der Stand und die nächste Zukunft der Geldforschung*, Berlin: Duncker & Humblot.
- TRAUTWEIN, H.-M. (1995), *Pure Credit Economies in Monetary Theory*, Working Paper no. 106, Department of Economics, University of Hohenheim.
- VANDERRYDT, H. (1898) “Note sur l’article de M. Walras concernant le comptabilisme social”, *Annales de l’Institut des Sciences Sociales*, vol. 4(4):

271-274.

- VANDERVELDE, É. (1895), “Le comptabilisme social. Deuxième mémoire”, *Annales de l’Institut des Sciences Sociales*, vol. 1(5): 230-246.
- WAGNER, A. (1862), *Die Geld- und Kredittheorie der Peelschen Bankakte*, Vienna: W. Braumüller.
- WALLACE, N. (1983), “A legal restriction theory of the demand for ‘money’ and the role of monetary policy”, *Federal Reserve Bank of Minneapolis Quarterly Review*, vol. 7(1): 1-7.
- WALRAS, L. (1897), “Lettre de M. le Professeur Walras [Au sujet du comptabilisme]”, *Annales de l’Institut des Sciences Sociales*, vol. 3(4), 219-220.
- WALRAS, L. (1898), “La Caisse d’Épargne Postale de Vienne et le comptabilisme social”, *Revue d’Économie Politique*, vol. 12(3), 202-220; also in: Walras (1992[1898]), 343-361.
- WALRAS, L. (1992[1898]), *Études d’Économie Politique Appliquée: Théorie de la Production de la Richesse Sociale*, in: A. & L. Walras, *Oeuvres Économiques Complètes*, Paris: Economica, vol. X.
- WARNOTTE, D. (1946), *Ernest Solvay et l’Institut de Sociologie. Contribution à l’Histoire de l’Énergétique Sociale*, Bruxelles: Ets. Emile Bruylant.
- WEGELIN, W. (1921), *Tauschsozialismus und Freigeld. Eine Dogmengeschichtlich-kritische Untersuchung zur Freigeldlehre*, München, Berlin & Leipzig: J. Schweitzer Verlag (Arthur Sellier).
- WICKSELL, K. (1997[1896]), “On the theory of tax incidence”, in: Wicksell (1997), Vol. 1, 57-115.
- WICKSELL, K. (1897), “Der Bankzins als Regulator der Warenpreise”, *Jahrbücher für Nationalökonomie und Statistik*, vol. 68: 228-243.
- WICKSELL, K. (1898), *Geldzins und Güterpreise*, Jena: G. Fischer.
- WICKSELL, K. (1936[1898]), *Interest and Prices: A Study of the Causes Regulating the Value of Money*, London: Macmillan.
- WICKSELL, K. (1902), *Guld och Sedlar*, Stockholm: Jacob Bagges Söner.
- WICKSELL, K. (1958[1904]), “Ends and means in economics”, in: E. Lindahl (Ed.): *Knut Wicksell - Selected Papers on Economic Theory*, London: Allen and Unwin, 51-66.
- WICKSELL, K. (1935[1906]), *Lectures on Political Economy*, vol. 2, London:

Routledge and Sons.

- WICKSELL, K. (1913), "Penningvärdets reglerande", *Ekonomisk Tidskrift*, vol. 15: 134-142; also in: Wicksell (1997), Vol. II, 46-52.
- WICKSELL, K. (1914), "Review of Mises (1912)", *Zeitschrift für Volkswirtschaft und Sozialpolitik*, vol. 23: 144-149; also in: Wicksell (1997), Vol. II, 220-224.
- WICKSELL, K. (1917), "Skandinaviens penningväsen", *Statsøkonomisk Tidskrift*, vol. 31: 169-186.
- WICKSELL, K. (1919a), "Riksbanken och privatbankerna", *Ekonomisk Tidskrift*, vol. 21: 177-188.
- WICKSELL, K. (1919b), "Ett angrepp på kvantitetsteorien", *Ekonomisk Tidskrift*, vol. 21: 59-63.
- WICKSELL, K. (1997), *Knut Wicksell - Selected Essays in Economics*, Edited by B. Sandelin, London: Routledge, 2 Vols.
- ZALESKI, L. (1897), "Lettre de M. Ladislas Zaleski, Professeur à l'Université [Au sujet du comptabilisme]", *Annales de l'Institut des Sciences Sociales*, vol. 3(5), 312-316.