A Schumpeterian Analysis of the Credit Market

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Abstract

Schumpeter shows that bank credit acts as money-capital and, therefore, constitutes the necessary premise for the realization of the innovative processes planned by entrepreneurs. This makes it important to specify the debt contracts between each bank and entrepreneurs during the prosperity phase of Schumpeter's cyclical development. The present paper aims to point out the achievements and the limits of Schumpeter's monetary theory with respect to this point, that is the debt contract design. On the side of the limits, I maintain that Schumpeter's approach, although representing one of the most stimulating contributions in the history of economic analysis, ask for refinements as regard to the objective-function of the individual banks, the determination of the interest rates, and the usableness of the credit demand and supply curves. Schumpeter’s posthumous treatise on money provides stimulating insights for the definition of these refinements.

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1. Introduction

Schumpeter's monetary theory gives great importance to the role of banks. It shows that bank credit acts as (money)-capital and, therefore, constitutes the necessary premise for the realization of the innovative processes planned by the entrepreneurs and their imitators. In a previous paper (Messori 2004) I have examined the differences between this monetary approach which Schumpeter (1954) names 'credit theory of money', and a more traditional approach labeled by the same author as 'monetary theory of credit'. The differences between these two approaches have offered the opportunity for a detailed analysis of the time sequence which characterizes Schumpeter's framework of the cyclical development. In this sequence, each production process takes time so that the purchase of productive inputs precede the sale of produced outputs; and this is the reason why credit matters and banks have a crucial role to play. However, in Messori (2004) I have not examined the determination of the debt contracts between banks and entrepreneurs (including imitators) during the two-phase cycle.

This is an analytical gap since Schumpeter's theory concerning the specification of the debt contracts between banks and innovative firms offers valuable hints and theoretical pieces in a field at length neglected by the economic theory, even by those approaches – mainly, the sequential schemes - which explicitly deal with the problem of how to advance credit to open the markets of inputs and then to start the production processes. In this respect, examples are offered by Wicksell (1898), Robertson (1926), and Keynes (1930). In these outstanding works the determination of the supply and demand functions in the credit market is oversimplified or exogenously given. The same applies to more recent sequential schemes. The analyses based on a single period (cf. Graziani 1992), treat banks’ supply as infinitely elastic and firms’ demand for credit as given; and, despite the stimulating attempts made by Hicks (1989) and Amendola-Gaffard (1998, ch. 2), the neo-Austrian multiperiod models of Hicks (1965) and Amendola-Gaffard (1988 and 2006) are unable to incorporate banks’ behavior in their analytical framework1. This prevents the sequential models to include in their more general scheme the results, reached in partial equilibrium, by the asymmetric information literature on the existence of financial intermediaries and on the working of the credit market (see

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1 Hicks (1956) denominates the analysis offered by single-period models as “single-period theory”, and that offered by multiperiod models as “continuation theory”. He maintains that, even if the “single-period theory is a part, and indeed an essential part, of dynamic analysis”, “it needs to be completed by some form of continuation theory if it is to do its properly dynamic job of analyzing a process” (p. 223).

The present paper aims to build up a Schumpeterian debt contract to be integrated with the just mentioned literature on the role played by banks. It should be noted that Schumpeter's approach leaves many problems unsolved as regard to the definition of the objective-function of the individual banks, to the determination of the interest rates, and to the usableness of the credit demand and supply curves. Hence, at first it is necessary to point out the main weaknesses of Schumpeter's analysis of the debt contracts signed by savers and innovators, and to suggest some solutions to these weaknesses in a Schumpeterian sequential framework. Then Schumpeter's assumptions on the behavior of lending banks must be fitted into this sequential framework, and the consequent determination of the credit market equilibria must be refined in a Schumpeterian vein. My sequential model is characterized by three periods: the first represents a stationary state, the second allows for the introduction of an innovative process, and the third marks the realization of the new output on the market. My analysis of the credit market is focused on the debt contracts signed at the opening phase of the second and third period.

The remaining parts of this paper are organized as follow. I first investigate the drawbacks raised by Schumpeter's analysis of the market relations between capitalists and entrepreneurs (section 2), and I outline possible improvements (section 3). I then point out the changes required by the substitution of banks for capitalists (section 4), and I refine Schumpeter's analysis of bank behavior in order to determine temporary equilibria in the credit market (section 5). This last step shows that a Schumpeterian approach to the credit market is robust to the criticism raised by Schumpeter himself (section 6), and highlights the important contribution that this approach could give as a precursor of the literature on the debt contracts design with asymmetric information (section 7). A point to be stressed is that, differently from what has been stated by many critics, *Das Wesen des Geldes* and - in general - the *Theory of money and banking*² play a crucial role in the drafting of this contribution.

**2. Interest rate in Schumpeter's monetary market**

Schumpeter's economic process takes place in a sequence of exchanges characterized by a time lag between the instant in which the producers purchase the desired inputs through the payment of money wages, and the instant in which they realize monetary proceeds through the sale of the final goods obtained utilizing those previously acquired inputs³. This time lag

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² For reasons explained in Messori (1997), under this latter title I mean not only the twelve chapters included in Schumpeter' treatise on money (Schumpeter 1970), but also four typescripts which are written in German and most likely represent chapters XIII, XIV and XV of this treatise. I found the four typescripts in the Harvard University Archives under Schumpeter, Joseph Alois, and I published them for the first time in an Italian edition (see Schumpeter 1996, first part).

³ Schumpeter (e.g.: 1912, ch.1) follows the Austrian representation of vertically integrated production processes and affirms that there are two productive factors: labor services and land services. In this paper I only refer to the labor
between the purchase of inputs and the sale of outputs can be neglected in the stationary state, since the unchanging reproduction of the economic process period after period allows for the synchronisation of the exchanges (cf. Schumpeter 1970, pp. 113-16). Vice versa, in the cyclical development, this same time lag implies that the entrepreneurs as innovators (and, even if for a smaller amount, their imitators) need an external financing in order to hire that amount of labor services which is necessary for the implementation of the innovative (or imitative) production processes. Following Schumpeter, in this paper I mostly assume that the only possible source of external financing is bank credit. As a consequence, I mainly examine how the debt contracts between banks and entrepreneurs are drawn up and how a temporary equilibrium in the credit market can be reached4.

In the Schumpeterian framework each debt contract between lending banks and borrowing entrepreneurs is characterized by two variables: the amount of the loan granted, and the level of the interest rate (see also below, n. 6). The definition of money as capital, the lack of a capital market and of a positive interest rate in the stationary state, and my arbitrary exclusion of land services imply that the amount of bank financing to new innovative firms is equal to the amount of money wages to be paid by these firms in order to purchase that amount of labor services necessary to start and complete their innovative activities. These definitions and assumptions also imply that Schumpeter’s interest rate is a purely monetary variable determined in the monetary (or credit) market5. In particular, being the premium of the present over the future purchasing power, the interest rate represents the cost that each innovator (or imitator) has to bear in order to realize her desired new production process and to obtain the related advantages in terms of *lucro captando* (or *damno evitando*). It follows that interest is the “*price of purchasing power*”, “originates in the hands of the entrepreneur”, and appears as a “tax” on her gross profits (cf. Schumpeter 1912, pp. 273-74, 317, 259-62 and 203; Eng. trans., pp. 182-4, 210, 173-5 and 125; see also: 1939, pp.123-6; 1970, pp.299-300).

4 It should be noted that I do not analyze in a detailed way the different forms taken by bank financing and the various possibilities to transform short-term bank credits into securities placed in the capital market (see Schumpeter 1970, pp. 176-89; see also: Schumpeter 1912, pp. 159-61; Engl. trans., pp. 111-12). Furthermore, it ought to be remembered that, in Schumpeter’s framework, the credit market and the security (or financial) market are not separated markets since the latter is reduced to a section of the former (cf. Schumpeter 1939, pp. 113-4, 618, and 621; 1970, pp. 315-18). Finally it should be noted that, in order not to complicate matters, from now on I will use the term entrepreneur for indicating both the innovators and the imitators.

5 It is evident that the monetary determination of Schumpeter’s interest rate depends on the lack of a positive interest rate in the stationary state. Many critics have considered the latter point as one of the most controversial results of Schumpeter’s analysis. However, Samuelson (1982) offers a possible rationale for Schumpeter’s position.

services because the analysis of the land services would require further qualifications. Moreover, I am assuming that the labor units are homogeneous.
each applicant to whom they grant loans\(^6\). Therefore, banks consider interests as being the refund for such a risk.

Let assume that \(n\) risk-neutral entrepreneurs enter into the stationary economic process at the beginning of period \(t\). Given that the Schumpeterian innovations imply a lengthening of the new production processes, the innovative firm of the entrepreneur \(i\) \((i = 1, 2, \ldots, n)\) must obtain loans to start its new activity as well as to complete it\(^7\). The demand for loans of entrepreneur \(i\) is addressed to a representative lender\(^8\). Schumpeter maintains that the productive units of the stationary state have a standard production function:

\[
Q_{ss} = Q(N_{ss}) \quad \text{with} \quad \frac{dQ_{ss}}{dN_{ss}} > 0, \quad \text{and} \quad \frac{d^2Q_{ss}}{dN_{ss}^2} < 0
\]  

(1)

whereas the firm of entrepreneur \(i\) has a production function characterized by a new technology, that is:

\[
Q_{i,t+1} = Q(N_{i,t}^{i}, N_{t+1}^{i}, A_{t+1}^{i}) \quad \text{with} \quad \frac{\partial Q_{i,t+1}}{\partial N_{i,t}^{i}} > 0, \quad \frac{\partial Q_{i,t+1}}{\partial A_{t+1}^{i}} > 0, \quad \frac{d^2Q_{i,t+1}}{dN_{i,t}^{i}N_{t+1}^{i}} < 0
\]  

(2)

where the symbols denote: \(Q_{ss}\) the amount of the final good produced by a representative productive unit operating in the stationary state, \(N_{ss}\) the quantity of labor employed by this same unit, \(Q_{t+1}\) the amount of the final good produced by entrepreneur \(i\) after two periods, \(N_{t}^{i}\) and \(N_{t+1}^{i}\) the quantity of labor employed by this same entrepreneur - respectively - in the first and second production period\(^9\), \(A_{t+1}\) the new state of technology made ready at the end of period \(t\) by means of \(N_{t}^{i}\).

Equations (1) and (2) imply that, if \(N_{ss} = N_{i}\), it will hold: \(Q_{i,t+1} > 2Q_{ss}\). Hence, innovation determines an upward shift of the production function without any significant change in its shape, that is, it determines an increase in labor productivity without eliminating the decreasing function of marginal labor productivity. In the stationary state productive units do

\(^6\) Cf. e.g.: Schumpeter 1912, p. 217; Eng. trans., p. 137 (and also p. 75 n.); 1939, p. 104 and n. It is well known that banks may share the risk with borrowers by including "collaterals" into the debt contracts. Schumpeter (1912, pp. 146-47; Engl. trans., pp. 100-1) examines this possibility. However, since the entrepreneur does not act in the stationary state, Schumpeter cannot assume that the function of innovators is dependent on the holding of wealth. On the other hand, to raise a mortgage on the final goods produced by means of innovative processes can guarantee banks vis-à-vis *ex-post* 'dishonest' behavior by entrepreneurs, but it does not eliminate the risk of their possible default. As a consequence, in Schumpeter's framework, the payment of interests to banks could also be interpreted in terms of 'property rights' (see: Swoboda 1984, pp. 27-8). For sake of simplicity, here I do not address these problems. This justifies my previous statement that the Schumpeterian debt contract has two dimensions: the level of the interest rate and the amount of financing.

\(^7\) Cf. Schumpeter 1939, p. 93. The Schumpeterian framework is based on a discrete time sequence which allows to isolate the analysis of the debt contracts in the credit market, and hence hinders the adoption of a continuous time dynamics. Moreover, for the sake of simplicity, I assume here that each innovative production process ends after two periods. This last assumption implies that financing of each innovation requires a two-periods debt contract (at the opening of \(t\)) as well as a one-period debt contract (at the opening of \(t+1\)). In the following I will unite these two contracts by means of some simplifications.

\(^8\) In the Schumpeterian system there are a number of competing lenders. However, for analytical reasons which will become clearer below, I temporarily assume that all the lenders have the same costs and information structure and hence a symmetric behavior. These assumptions will be dropped analyzing Schumpeter’s supply function of financing.

\(^9\) For the sake of simplicity, I assume here that \(N_{t} = N_{t+1} = N_{i}\).
realize neither profits nor losses. At the opposite, due to the the productive impact of innovation, entrepreneurs have a positive expected profit. Thus, Schumpeter can state that the demand for financing made by each entrepreneur depends on her profit expectations and the level of the interest rate: entrepreneur \( i \) finds it convenient to apply for the amount of financing which would allow her to realize that level of final good which, at the margin, makes the rate of her expected monetary profit – gross of financial charges – equal to the money interest rate. On the other hand, Schumpeter can state that the loan supplied by the representative lender to a given borrower depends on the interest rate, the borrower’s risk of default expected by the same lender, and the costs of supplying this loan.

The above analysis is important for determining the debt contracts between a representative lender and an innovative firm as well as their supply and demand functions. For the sake of simplicity, let assume that the innovative production function is common knowledge and that the expected market prices of the final good are given. Let also assume that each debt contract is a standard one, that is, at the expiring date the lender will collect the principal and the interests set by this contract, if the innovative firm is solvent, or the whole proceeds of the activity financed, if the innovative firm defaults. Remember that the debt contracts must finance a double purchase of that amount of labor services required to start and realize the innovative process: the first debt contract ends after the double time lag elapsing between entrepreneur’s first purchase of inputs and entrepreneur’s sale of the final good, whereas the second debt contract lasts the period \( t+1 \). Let assume that both contracts are set at the beginning of period \( t \); referring to a given innovative process, their terms are thus the same. Denoting with \( L_t \) and \( L_{t+1} \) the loans actually granted by the representative lender to entrepreneur \( i \) – respectively – at the beginning of the first and of the second period of her innovative process and remembering that \( L_t = L_{t+1} = L_i \) (see n. 9), we have:

\[
L_t = L_d (r_i, \rho_i^D) \quad \text{with } \frac{\partial L_d}{\partial r_i} < 0; \quad \frac{\partial L_d}{\partial \rho_i} > 0 \tag{3}
\]

\[
L_i = L_s (r_i, \sigma_i, c_i) \quad \text{with } \frac{\partial L_s}{\partial r_i} > 0; \quad \frac{\partial L_s}{\partial \sigma_i} < 0; \quad \frac{\partial L_s}{\partial c_i} < 0 \tag{4}
\]

\[
\rho_i = E\{\max[X_i(2L_i) - ((1 + r_i) + (1 + r_i)^2) L_i; 0]\} \tag{5}
\]

\[
\pi_i = E\{\min[((1 + r_i) + (1 + r_i)^2) L_i; X'_i(2L_i, \sigma_i)] - (1 + c_i)2 L_i\} \tag{6}
\]

where the symbols denote: \( L_d \) and \( L_s \) – respectively – the total demand for loans of entrepreneur \( i \) to the representative lender and the total supply of loans of the latter to the former, \( r_i \) the interest rate on the debt contracts, \( \rho^D_i \) and \( \rho_i \) the expected monetary profits of entrepreneur \( i \) – respectively – before- and after-interests payment, \( X_i \) and \( X'_i \) – respectively – her expected monetary proceeds and her monetary proceeds expected by the representative lender, \( \pi_i \) the net return expected by the representative lender on the financing of entrepreneur \( i \), \( \sigma_i \) the \( i \)'s risk of default expected by the same lender, \( c_i \) the unitary cost related to this loan.
As in the standard analysis, equations (3) and (5) can be graphed by means of a demand curve for financing of each individual entrepreneur which is decreasing in the interest rate and parametric to her expected rate of gross monetary profit, and equations (4) and (6) can be graphed by means of a supply curve of financing of the representative lender to an individual entrepreneur which is increasing in the interest rate and parametric to lender’s expectation on this entrepreneur’s default risk and to the costs of the loan. At the equilibrium, \( L_{D}^{l} = L_{S}^{l} = 2L_{t} \equiv (L_{t} + L_{t+1}) \)

It is well known that Schumpeter refuses the method of aggregates (see for instance: 1935, p. 136; 1936, pp. 154-5; 1939, pp. 43-4; 1946, p. 210; 1970, p. 269). However, in order to determine the actual amount of financing compatible with the equilibrium in the monetary (or credit) market, the author has to build the function of the total demand for financing made by the whole set of \( n \) entrepreneurs at the beginning of periods \( t \) and \( t+1 \) and the function of the total supply of financing made by the whole set of lenders.

Let start with the total demand function. Schumpeter (1912) seems to suggest that this function is just the aggregation of the individual demand functions made by each of the \( n \) entrepreneurs. Hence, given equation (3), we would have: \( L_{D} = \sum_{i=1}^{n} L_{D}^{i} \). Moreover, the author adds that all the points of the related demand curve must equalize the interest rate and the marginal profit rate expected by the "last entrepreneur"\(^{10}\). It results:

\[
L_{D} = L_{D} (r_{t}, \rho_{t}^{g}) \quad \text{with} \quad \frac{\partial L_{D}}{\partial r_{t}} < 0; \quad \frac{\partial L_{D}}{\partial \rho_{t}} > 0 \tag{7}
\]

\[
\rho_{t}^{g} (2L_{t}) = r_{t} \tag{8}
\]

where the suffix \( l \) denotes that the variable refers to the "last entrepreneur".

As to the supply function, Schumpeter starts from a simplified case, that is, the “exchange between entrepreneurs and capitalists” in the monetary market. However, the author must face a double problem of aggregation since he replaces the representative lender with \( m \) savers playing the role of capitalists\(^{11}\). Schumpeter has thus to build the microeconomic supply function of capitalist \( j \) (with \( j = 1, 2, ..., m \)) towards the whole subset of his borrowers, and then the total supply function of all the \( m \) capitalists towards the whole set of the \( n \) entrepreneurs. He maintains that the points of the supply curve of capitalist \( j \) must make his expected marginal utility equal to his marginal sacrifice which can be determined by his rate

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\(^{10}\) In Schumpeter’s words (1912, p. 292; Engl. trans., pp. 193-94), the “last entrepreneur” can be defined as being the entrepreneur with the lowest marginal profit rate which is expected from the innovative project, that is, as being "the one who anticipates from carrying out his project a profit which just makes the interest payment possible”.

\(^{11}\) Cf. Schumpeter 1912, pp. 288-99; Engl. trans., pp. 191-98. It should be noted that Schumpeter’s capitalist may only transfer to entrepreneurs an amount of means of payment already circulating in the stationary state. This means that, whilst Schumpeter’s banker creates means of payment, Schumpeter’s capitalist can play, at the most, a function of financial intermediation between savers and entrepreneurs. However, in this last respect, I do not separate capitalists and savers; hence, the former do not bear a direct cost to have the availability of means of payment to lend. My following reconstruction does not aim to reach a philological accuracy but to rationalize the meaning of Schumpeter’s analysis. This reconstruction also neglects to assess the degree of (in)compatibility between the role played by capitalists and the working of the stationary state.
of discount ($\delta$); then, he adds that all the points of the total supply curve must equalize the interest rate (net of the expected marginal default rate) and the rate of discount of the "last capitalist". Hence, given equation (4), we would have: $L_s^h = \sum_{h=1}^{n} L_s^h = L_s(r_h, \sigma_h, \delta_h)$, where $v$ ($v \leq n$) is the subset of the $n$ entrepreneurs who borrow from capitalist $j$ ($h=1,2,...,v$); and $L_s = \sum_{j=1}^{m} L_s^j$. It results:

$$L_s = L_s(r_t, \sigma_t, \delta_t) \quad \text{with} \quad \frac{\partial L_s}{\partial r_t} > 0; \quad \frac{\partial L_s}{\partial \sigma_t} < 0; \quad \frac{\partial L_s}{\partial \delta_t} < 0 \quad (9)$$

$$r_t - \sigma_t = \delta_t \quad (10);$$

where the suffix $l$ denotes that the variable refers to the "last capitalist".

According to the author (Schumpeter 1912, pp. 203 and 295-97; Engl. trans., pp. 125 and 193-95), (7)-(8) and (9)-(10) lead to the determination of that level of the equilibrium interest rate ($r^*$) which guarantees the equilibrium in the monetary market. We would have:

$$L_D (r_t, \rho_t^\alpha) = L_S (r_t, \sigma_t, \delta_t) \quad (11)$$

$$\rho_t^\alpha (2 L_t) = \delta_t + \sigma_t \quad (12).$$

3. A refinement of Schumpeter’s analysis

Equations (11) and (12) synthetize Schumpeter’s analysis of the exchange between capitalists and entrepreneurs in the monetary market. This analysis, which determines a single equilibrium interest rate in the monetary market, can be questioned at least for two reasons (see also Messori 1986, secs. 2 and 3): (a) the curves of the total demand and supply of loans are not homogeneous, and (b) the supply behavior of capitalists is not thoroughly specified.

Concerning (a), it should be noted that the total supply curve of loans is increasing in the interest rate mainly because it is based on a 'descriptive' ordering, i.e. capitalists rank and 'serve' their borrowers according to their expected increasing default risk. There is no reason that such a descriptive ordering, which leads to 'spurious' margins (see Sraffa 1960), should correspond to the functional ordering at the basis of the total demand curve for financing, which leads to 'pure' margins. It could easily happen that, at Schumpeter’s supposed equilibrium interest rate, a subset of entrepreneurs has a positive demand for financing but each capitalist is ready to 'serve' them only at interest rates higher than their reservation level. Concerning (b), it ought to be remembered that capitalists can only offer – by assumption (see n. 11) – the already existing amount of their savings, and that they are able to order the different borrowers according to the (expected) default risk subjectively attributed

---

12 The marginal sacrifice, measured by the rate of discount, represents the cost of loans borne by the capitalist. Hence, $\delta$ is a specification of the generic unitary cost $c$ in equation (3). Analogously to the “last entrepreneur” (see footnote 10), the “last capitalist” can be defined as being the capitalist with an interest rate (net of the expected default rate) on his marginal loan which just equalizes his discount rate.
to them. The former hypothesis implies that the last part of the total supply curve of means of payment could be infinitely rigid, the latter hypothesis offers to capitalists the possibility of realizing a profitable price discrimination of their borrowers. Schumpeter overlooks both these points.

The analytical solution of the problems, raised by points (a) and (b), makes it necessary that each capitalist offers separating debt contracts to his potential borrowers with different expected profits and risks of default. I previously indicated the subset of the \( n \) entrepreneurs who can borrow from capitalist \( j \) (\( j = 1, 2, \ldots, m \)) as the subset \( \nu \) (with \( h=1,2,\ldots, \nu \)). Hence, it is convenient for capitalist \( j \) to group his \( \nu \) potential borrowers in \( \Omega \) risk classes (\( \Omega \leq \nu \)), each of them composed by borrowers with the same expected profit and risk of default. Let assimilate the choices of Schumpeter’s capitalists to the behavior of a traditional saver under risk. Let also assume that Schumpeter’s capitalists are risk-averse due to their limited amount of wealth. Hence capitalist \( j \) aims to solve the following intertemporal optimization problem:

\[
\max_{C_{j1},C_{j2}} \frac{U_j(C_{j1}) + U_j(C_{j2})}{(1 + \delta_j)}
\]  

s.t. \( p_1 C_{j1} \leq S_j \cdot L_j \) \hspace{1cm} (13)

\[
p_2 C_{j2} \leq \{(1 - \sigma_k) (1+ r_{j1} + (1 + r_{j1})^2) + \sigma_k X_k + (1 - \sigma_k) (1+ r_{j2} + (1 + r_{j2})^2) + \sigma_k X_k + \ldots + (1 - \sigma_k) (1+ r_{j\Omega} + (1 + r_{j\Omega})^2) + \sigma_k X_k + \ldots + (1 - \sigma_k) (1+ r_{j\Omega} + (1 + r_{j\Omega})^2) + \sigma_k X_k \}
\]

\[
S_j \geq 2L_j = 2L^1_j + 2L^2_j + \ldots + 2L^j_k + \ldots + 2L^j_\Omega = \sum_{k=1}^\Omega 2L^j_k
\]  

where: \( C_{j1} \) and \( C_{j2} \) denote the consumption of capitalist \( j \) after – respectively – one and two time lags, \( p_1 \) and \( p_2 \) the related prices, \( \delta_j \) the discount rate of capitalist \( j \), \( S_j \) his initial amount of wealth, \( L_j \) the financing by this same capitalist of the whole set of his potential borrowers, \( L^j_k \) his financing of the whole subset of his potential borrowers in the \( k \) risk class (where \( k=1,2,\ldots, \Omega \)), \( r_{jk} \) and \( \sigma_{jk} \) respectively – the interest rates and the expected default rates on the \( k \) risk class, \( c_k \) the unitary cost related to the supplies of loans to the \( k \) risk class, \( X_k \) the monetary proceeds of the \( k \) risk classes cashed by capitalist \( j \) in case of total default\(^{13}\).

Given that the constraints (14), (15) and (16) are binding and that it is possible to refer to a concave and twice differentiable utility function of capitalist \( j \), the maximization problem (13)-(16) has an analytical solution. However, in order to stress some points which will be useful in examining bank’s behavior (see below, sec. 4), let me introduce some simplifications and have recourse to a graphic solution\(^{14}\).

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\(^{13}\) The definition of \( X_k \) shows that the economic meaning of this symbol cannot be confused with the economic meanings of the symbols \( X_j \) and \( X_k \), as stated above.

\(^{14}\) Let recall that the paper is focusing on the relationship between banks and entrepreneurs. Hence, the analysis of capitalists’ behavior in the monetary market is instrumental to the analysis of ‘banks’ behavior in the credit market.
Let me reduce the $\Omega$ risk classes to two (class 1 and class 2; where $\sigma_1 < \sigma_2$), and assume that capitalist $j$ will have a return equal to zero on the loans to borrowers in default (that is, $X_i = 0$). These two simplifications imply that the constraint (15) becomes:

$$p_2 C_2 = (1 - \sigma_1) L_1 [(1 + r_1) + (1 + r_1)^2] - c_12 L_1 + (1 - \sigma_2) L_2 [(1 + r_2) + (1 + r_2)^2] + [(S - 2L) - p_1 C_1] - c_22 L_2$$

Equation (15 bis). In its turn, (15 bis) implies that the utility-maximizing risk averse capitalist $j$ will be ready to finance both subsets of his potential borrowers, included in the two different risk classes, if and only if:

$$(1 - \sigma_1) [(1 + r_1) + (1 + r_1)^2] < (1 - \sigma_2) [(1 + r_2) + (1 + r_2)^2] - 2 (c_2 - c_1)$$

Putting $\alpha = \sqrt{1 - \sigma_1}, \beta = \sqrt{1 - \sigma_2}$, and $\Delta c = \frac{(c_2 - c_1)}{\sqrt{1 - \sigma_2}}$, equation (17) can be re-written as:

$$r_2 > \frac{\alpha - \beta}{\beta} + r_1 + \Delta c$$

that is, putting $\Theta = \frac{\alpha - \beta}{\beta}$ and $\Psi = \frac{\alpha}{\beta}$, as:

$$r_2 > \Theta + \Psi r_1 + \Delta c$$

Equation (17 bis). The assimilation of $c_k$ to capitalist $j$'s discount rate ($\delta_j$; cf. n. 12 above) and capitalists' risk aversion suggest that $c_k$ is increasing in $L_{S_k}$ so that $\Delta c > 0$. Moreover, given that $r_1, r_2 \geq 0$ and that $\alpha, \beta \geq 0$ and $\beta < \alpha$ (due to the fact that $\sigma_1, \sigma_2 \leq 1$ and $\sigma_1 < \sigma_2$), $\Theta > 0$ and $\Psi > 1$. Hence, equation (17 bis) implies that $r_2 > r_1$; and in the extreme case where the first class of borrowers is risk-free and the costs of lending are zero so that $r_1 = 0$, it implies that $r_2 > \frac{\alpha - \beta}{\beta}$.

These results lead to a graphic solution of the maximization problem (13) – (16). Equation (3) allows to write the demands for loans of the entrepreneurs who are the potential borrowers of capitalist $j$ (that is, the subset $v$, with $v \leq n$: see above) and are included by the latter in the risk classes 1 and 2. These two demands are, respectively:

$$L_{D1} = \sum_{h'=1}^z L_{D1} h' = L_D (r_1, \rho_1) \quad \text{with} \quad \frac{\partial L_{D1}}{\partial r_1} < 0; \quad \frac{\partial L_{D1}}{\partial \rho_1} > 0$$

Equation (3a).

$$L_{D2} = \sum_{h''=z+1}^v L_{D2} h'' = L_D (r_2, \rho_2) \quad \text{with} \quad \frac{\partial L_{D2}}{\partial r_2} < 0; \quad \frac{\partial L_{D2}}{\partial \rho_2} > 0$$

Equation (3b).

On the other hand, equation (4) allows to write the supplies of loans of this same capitalist $j$ to the subset $v$ of his potential borrowers grouped in the risk classes 1 and 2. These two supplies ($L_{S1}^j$ and $L_{S2}^j$ where $L_S^j = L_{S1}^j + L_{S2}^j$) are, respectively:

$$L_{S1}^j = \sum_{h'=1}^z h' = L_S (r_1, \sigma_1, c_1) \quad \text{with} \quad \frac{\partial L_{S1}}{\partial r_1} > 0; \quad \frac{\partial L_{S1}}{\partial \sigma_1} < 0; \quad \frac{\partial L_{S1}}{\partial c_1} < 0$$

Equation (4a).

$$L_{S2}^j = \sum_{h''=z+1}^v h'' = L_S (r_2, \sigma_2, c_2) \quad \text{with} \quad \frac{\partial L_{S2}}{\partial r_2} > 0; \quad \frac{\partial L_{S2}}{\partial \sigma_2} < 0; \quad \frac{\partial L_{S2}}{\partial c_2} < 0$$

Equation (4b).

where: $h = h' + h''$; $h' = 1, 2, \ldots, z$; $h'' = z + 1, z + 2, \ldots, v$; and $z \leq v$.

\footnote{To simplify the notation, I also drop the suffix $j$.}
Functions (3a) and (3b) are sufficient to immediately justify the decreasing slope of the two corresponding demand curves with respect to \( r \). Instead functions (4a) and (4b) are not so clear-cut towards the slope of the supply curves. Given that \( \sigma \) is – by definition – constant inside each risk class, the slope of \( L_{S1}^j \) and \( L_{S2}^j \) with respect to \( r \) will depend on the possible links between \( c_k \) and \( L_{Sk}^j \) (where: \( k = 1, 2 \)). As just stated, \( c_k \) is increasing in \( L_{Sk}^j \). Hence the two supply curves have an increasing slope with respect to \( r \). Together with condition (17 bis), these conclusions lead to the following representation of the Schumpeterian equilibrium in the monetary market (see Figures 1 and 2).

\[ \text{Figure 1} \]
Figure 2a

Price rationing for all the borrowers of class 2 since \( r_2 > \Gamma \) for \( \Gamma' > \Gamma \)
\[ OA = C, \]
\[ OB = L_1, \]
\[ OF = S, \]
\[ \Gamma' = \Theta + \gamma r_1 + \Delta C \]

Figure 2b

Quantity rationing for a subset of borrowers of class 1 (BF)
"Red lining" for all the borrowers of class 2
\[ OA = C, \]
\[ OB = L_1, \]
\[ OF = S, \]
\[ BF = q, \text{ rationing} \]
\[ r^{n} \text{ notional Walrasian rate of interest for class 1} \]
Differently from Schumpeter’s flawed analysis, Figure 1 shows that the working of the monetary market does not lead to a single equilibrium interest rate but to a possible equilibrium interest rate for each of the risk classes (in my graphic representation, \( r_1^* \) and \( r_2^* \)). Moreover this Figure shows that, since capitalist \( j \) can only offer the existing amount of his past savings \( (S_j) \), the last parts of his supply curves are infinitely rigid. Finally it shows that risk averse capitalist \( j \) finances, first, entrepreneurs ranked in the class with the lowest risk and, then, entrepreneurs in the class with the highest risk but at an interest rate at least equal to \( \theta + \gamma r_1 + \Delta c \). This behavior of capitalist \( j \) implies that the \( L_{S_1}^j \) curve is not effective (that is, it is notional) over \( \theta + \gamma r_1 + \Delta c \) (cf. the relative dotted line), and that the part of the \( L_{S_2}^j \) curve is not effective (notional) between \( r^*_j \) (\( \geq 0 \)) and \( \theta + \gamma r_1 + \Delta c \) – that is, it is infinitely rigid at an amount of financing equal to 0 (cf. the relative dotted line). As shown by Figure 2a, these features of the supply curves of capitalist \( j \) can lead to a price rationing for all the borrowers of class 2, even if some of them would be ready to pay an interest rate higher than \( \theta + \gamma r_1 + \Delta c \). It is sufficient that the \( L_{D_2} \) curve crosses the \( L_{S_2}^j \) in its notional part. Moreover, as shown by Figure 2b, the rigidities of the last parts of capitalist \( j \)’s supply curves can imply a quantity rationing for a subset of the borrowers of class 1 and a null supply of means of payment (“red lining”: see Stiglitz-Weiss 1981) for the borrowers of class 2. It is sufficient that the \( L_{D_1} \) curve crosses the \( L_{S_1}^j \) curve in its last part.

Assuming that each of the \( n \) entrepreneur addresses her demand for financing to all the \( m \) competing capitalists, it follows that each entrepreneur will find convenient to sign the debt contract which grants her the demanded amount of financing at the lowest interest rate. Hence the actual demand of entrepreneur \( i \) (\( i = 1, 2, \ldots, n \)) is addressed to that capitalist who ranges her in the risk class with the lowest interest rate and who is ready to fully ‘serve’ her. This leads to an actual total demand for and to an actual total supply of financing for each of the risk classes, which determine an equilibrium interest rate for each of these classes. Compared to the single equilibrium interest rate which is stated by Schumpeter, this set of the equilibrium interest rates leads to a screening of borrowers and, therefore, it improves ex ante the social efficiency\(^{16} \). Moreover, a specific group of potential borrowers can have a positive excess demand for loans, and can thus suffer a sort of price or quantity credit rationing. The latter involves a sort of “red lining” for the groups of potential borrowers ranked in higher risk classes than that partially rationed by all the \( m \) capitalists.

4. Interest rates and bank behavior

Schumpeter (1912, 1917-18, 1939) does not perceive the importance of problems (a) and (b) stated at the beginning of section 3, and the consequent possible solutions. Schumpeter

\(^{16}\) What just stated is insufficient to determine the distribution of surplus between entrepreneurs and capitalists. The fact that the net profit is completely awarded to the former or the latter, or else that it is divided in more or less fair way, depends on the structure of the monetary market. Furthermore, it should be noted that the separating contracts are at the basis of the models with signalling.
points out, instead, the changes in the partial equilibrium of the monetary market (from now on, credit market) when capitalists give way to banks. The most prominent change occurs because banks, rather than limiting themselves to act as intermediaries with respect to the amount of money circulating in the stationary state, create means of payment ex novo. As a consequence, it is the bank credit which mainly determines bank deposits, and not vice versa (e.g.: Schumpeter 1970, pp. 181 and 183-89). According to Schumpeter (1912, p. 294; Engl. trans., p. 195), this change implies that the "previous picture of reality is altered, but is not made unusable in its main features": the analysis of the demand for financing "remains provisionally unaltered", whilst the analysis of the supply of financing has to take into account that banks have a more elastic behavior than capitalists but also new constraints.

Let me clarify Schumpeter's last statement by comparing banks' behavior with my previous analysis of capitalists' money supply. The credit supply of each bank continues to be affected by its expectations concerning the default risk of the potential borrowers, and it depends on the level of interest rates on loans and on bank deposits or other forms of bank debt\textsuperscript{17}. However, bank credit supply does not imply any kind of sacrifice for transferring the present purchasing power into the future\textsuperscript{18}. On the other hand, following Schumpeter (1939, p. 126; see also 1970, p. 148), I assume that the credit market is characterized by imperfect competition so that each of the $m$ banks exerts a – more or less stable – control on a specific subset of borrowers. This monopolistic power implies that each bank enjoys discretionary margins in the determination of its interest rates. This same power also implies that, in order to make its lending a "sound" activity, the individual bank must keep the default risks of its subset of borrowers under control, that is, it must judge "the chances of success of each purpose and, as a means to this end, the kind of man the borrower is, watching him as he proceeds and granting or withholding further support accordingly" (Schumpeter 1939, p. 641). Obviously the screening made by each bank cannot affect, ex ante, the decisions taken by the potential borrowers concerning the innovations to be introduced; however, this screening can bind the realization of (a part of) those innovative decisions and, furthermore, it can act as a positive or negative incentive for the initiatives of the most loyal customers (ibidem; see also: 1917-18, pp. 104 and 109; Engl. trans., pp. 202 and 206).

Schumpeter is aware that these observations are not sufficient for specifying banks' behavior as to the supply of loans. The latter is also constrained by the fact that bank creation of means of payment contributes to the determination of bank deposits and, together with the actual default of borrowers, may induce a liquidity shortage in the balance of the individual banks and/or of the banking system. If the portion of bank deposits to be transformed into

\textsuperscript{17}The credit supply of each bank is also dependent on its direct costs of creation of means of payment, which are neglected in this paper.

\textsuperscript{18}My Schumpeterian (as well as Schumpeter's) credit theory of money obviously excludes that banks have any power of 'seignorage'. This means that the individual banks cannot finance their own purchases of goods and services through the creation of their own means of payment.
legal tender was limited and stable and if there were not institutional constraints\textsuperscript{19}, the default of borrowers and the increase in credit granting would not represent binding constraints for the banking system as a whole. At this macroeconomic stage, the banking system would be able to transform 'bad' credits into temporary 'good' credits through the refinancing of the activities already financed but in financial straits (see Schumpeter 1912, pp. 163-64; Engl. trans., pp. 114-15; 1927, p. 98; 1970, pp. 189-90). Schumpeter does not follow, however, this line of analysis. Consistently with the criticism to the method of the aggregates (e.g.: Schumpeter 1935, p. 136; 1936 pp. 154-55; 1939, pp. 43-4; 1946, p. 210; 1970, p. 269), he starts by analyzing the credit supply of the individual banks and not that of the banking system. This makes the Schumpeterian analysis of bank behavior more accurate and interesting than Wicksell's.

Schumpeter rightly underlines that the rejection of the traditional thesis, according to which a given bank would limit itself to lend the 'money' of its depositors and – therefore-could not grant an amount larger than its deposits, does not imply that the credit supply curve of the individual banks becomes unbounded. This rejection is compatible with the idea that the amount of credit supplied is "an elastic, though nevertheless a definite, magnitude" (Schumpeter 1912, p. 164; Engl. trans., p. 114; Schumpeter 1917-18, p. 107; Engl. trans., p. 204). It follows that also Schumpeter's total supply of credit meets quantitative constraints: although it is difficult to "state the limit to the creation of purchasing power [...] as accurately as, say, the limit to the production of a commodity [...], yet we can state that there is such a limit at any time and what circumstances normally guarantee its maintenance" (Schumpeter 1912, p. 163; Engl. trans., p. 113). Hence, differently from Wicksell (1898) and Hahn (1920), Schumpeter's total supply function of credit is bounded and cannot be reduced to a curve infinitely elastic at the interest rate exogenously set by the banking system.

I consider this conclusion as a mainstay for the analysis of the Schumpeterian debt contract between banks and innovative firms. However, it is necessary to be more specific about the elastic but binding constraints to the creation of means of payment by bank \( j \) \((j=1,2,...,m)\), and about the related supply curves. Following Schumpeter, I assume that there is an issuing central bank in a credit market with imperfect competition. It would be possible to examine different institutional sets-up of the monetary system which are compatible with this assumption. Still in agreement with Schumpeter I choose, as a benchmark, a monetary system where: the \( m \) (commercial) banks are organized around a central bank but the latter does not command legal constraints on bank transactions (for example, a minimum reserve ratio); it does not exist a well-organized interbank market but each commercial bank "has, at any time,

\textsuperscript{19} As it will be specified at a later stage, Schumpeter (e.g.: 1912, pp. 161-63; Engl. trans., pp. 112-14) refers to an economy based on a free gold standard system as well as to an economy where legal tender and bank money coexist. In both cases, the non-bank agents may require the conversion of 'claims' on money into money-gold or legal tender. Obviously, the problem of conversion would not be present in a 'pure credit' system, but Schumpeter refers very seldom to such a system (see 1912, p. 164; Engl. trans., p. 115; 1917-18, p. 110; Engl. trans., p. 206).
to convert its deposits on request to a fixed rate in the units of a good”. This organization of
the monetary system can be called “free gold standard” system without interbank market\(^{20}\).
Let me also assume that, differently from capitalists, banks are risk-neutral since their lending
activity is not constrained by a given amount of past savings.

According to Schumpeter (cf. 1912, pp. 162-3; Engl. trans., pp. 113-14; 1927, pp. 96-8;
1939, pp. 120-2; 1970, pp. 191-92), in such a system the supply of bank \( j \) is constrained by
four factors: (i) the demand functions of each of its potential borrowers \((h=1,2,\ldots,v)\), as stated
by equations (3a) and (3b) above; (ii) the default risk of these borrowers expected by the
same bank \( j \); (iii) the amount and the cost of this bank’s liquidity which also depend on the
total expected demand for conversion into gold of its 'claims' on money; (iv) the behaviors of
the competing banks and their aggregate effects. Like in my previous analysis of capitalist \( j \),
the profit-maximizing bank \( j \) fully exploits its power of discrimination towards its \( v \)
borrowers. This means that bank \( j \) groups its potential borrowers with the same expected
profits and default risk into a specific risk class and gives rise to a number of supply curves of
loans equal to the number of risk classes needed to rank the complete set of these borrowers
(\( \Omega \) risk classes: \( 1 \leq \Omega \leq v \), with \( k =1,2,\ldots,\Omega \)). Let me assume that the deposits market
is characterized by perfect competition.

Factors (i)-(iv) and this last assumption suggest that the maximizing behavior of the
Schumpeterian bank \( j \) can be modeled as:

\[
\max \pi_j = \max \{ \sum_{k=1}^{\Omega} [(1 - \sigma_k) L_{Sk}(1 + r_{jk} + (1 + r_{jk})^2) + \sigma_k X_k] - (2L_j + iD_j + i_B CB_j) \} \tag{18}
\]

subject to:

\[
(1 - \sigma_k)[(1 + r_{jk}) + (1 + r_{jk})^2] + \sigma_k \frac{X_k}{L_{Sk}} \geq 1 + (iD_j + i_B CB_j) \frac{L_{Sk}}{2L_j} \quad \forall \ k \text{ with } L_{Sk} > 0 \tag{19}
\]

\[
L_{Sh}^j \leq L_{Dh} \quad \forall \ h = 1, 2, \ldots, v \tag{20}
\]

\[
L_{Sk}^j = 0 \quad \text{if } \ 2L_j - \sum_{k=1}^{\Omega-1} L_D \leq 0 \tag{21}
\]

\[
G_j + CB_j(i_B) \geq 2L_j - \sum_{j} \frac{2L_j}{m} + g_j(q^*, \psi_j)D_j \tag{22}
\]

with \( CB_j < G_{CB_j} \frac{dC_{B_j}}{d_i_B} > 0 \); \( \lim_{q \to q^*} g_j(q^*, \psi_j) = 1 \)

where the new symbols denote: \( 2L_j \) the total amount of credit supplied by bank \( j \) at
the opening of the two periods characterized by the innovative processes (that is \( \sum_{k=1}^{\Omega} L_{Sk}^j \equiv \)

---

system is one of the most complex set-up of the credit and monetary markets; hence, its analysis can be easily extended
to simpler cases. The exclusion of a minimum reserve ratio and of other legal constraints aims to avoid any
accommodation with respect to the thesis to be proved. However let me note that, according to Schumpeter (1939, p. 122;
1970, p. 190), not even the introduction of legal limitations would lead to rigid constraints in bank creation of means of
payment. The individual banks may, in fact, resort to various technical devices (which today are often named "financial
innovations") in order to loosen those constraints even in the lack of a well-organized interbank market. Let me finally
recall that I am assuming that the creation of means of payment does not imply direct costs of 'production'.
The amount of deposits held by this same bank, $i$ the market interest rate on deposits, $G_j$ and $G_{CB}$ the stock of gold held – respectively – by bank $j$ and by the central bank, $CB_j$ the amount of gold lent by the central bank to bank $j$ and $i_B$ the related interest rate, $g_j$ the rate of conversion of deposits into gold expected by bank $j$, $q^e$ the expected rate of inflation, $\psi_j$ a random variable specific to bank $j$.

It can be useful to specify the economic meaning of the four constraints (19)-(22). (19) underlines that bank $j$ does not offer debt contracts with negative expected profits to any set of its borrowers grouped in a given risk class. (20) represents bank $j$’s demand or rationing constraints, whereas (21) emphasizes the possibility of “red lining”. Finally (22) represents the liquidity constraint of bank $j$: it implies that bank $j$ must hold an amount of gold reserves sufficient for satisfying the request, made by non-bank agents or by competing banks, to convert into gold the ‘claims’ on money created by this same bank; as an alternative, bank $j$ must be adequately re-financed in gold by the central bank. Let assume that constraint (22) is always binding for $CB_j$. One or more of the other three constraints can also be binding.

5. The equilibria in a Schumpeterian credit market

Equation (18) and constraints (19)-(22) point out that, like in my previous analysis of capitalist $j$, each profit-maximizing bank fully exploits its expected power of discrimination with respect to its borrowers. Hence bank $j$ groups its potential borrowers judged with the same expected profit and default risk into a given risk class, and determines a number of functions of loans supply which is equal to the number of risk classes ($\Omega$) needed to rank the complete set of these borrowers. However, to fully understand the behavior of bank $j$, some additional analysis of constraint (22) and of other constraints is required.

As just stated, constraint (22) is always binding. This means that, when the amount of credit offered by bank $j$ within each (risk) class increases, the amount of gold lent by the central bank to this bank must increase; and, in its turn, this increase implies an increase in the related interest rate, $i_B$. It follows that the credit supply curve of bank $j$ in each risk class $k$ is increasing in the interest rate $r^k$.

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21 It should be noted that the gold reserve of the central bank is limited. Therefore, the possibility to re-finance commercial banks with gold (in case of liquidity shortage) is subject to limitations. This explains why Schumpeter treats the gold standard system as a real, and under many aspects desirable, monetary organization rather than as a theoretical case by now out of date. According to Schumpeter (see 1925; 1970, pp. 223-4; see also Shah-Yeager 1994, pp. 447 and 453), without money convertibility into gold, the issuing central bank would enjoy so wide discretionary margins as to make possible or to (more than) counter any credit policy.

22 Schumpeter can set up a direct link between the interest rate on loans and the total amount of credit supplied since he builds a unique credit supply curve based on a descriptive ordering. On the other hand, here it would be possible to justify an increasing credit supply curve of each bank in a given risk class also by assuming that the expected default risks of borrowers, grouped in this class, is increasing. The recent literature offers various possible explanations: adverse selection effects, negative incentive effects, and so on.
Moreover, constraint (22) is characterized by the fact that the amount of the conversion into gold, faced by bank \( j \), also depends on its credit supply policy relatively to that of the banking sector as a whole. By assumption, in the monetary system under examination there is not a well-organized interbank market, and the deposit market is of perfect competition so that the total flow of deposits is equally allocated among individual banks\(^{23}\). On the other hand, bank creation of means of payment gives rise to an equal increase in the sum between bank deposits and the conversion demand for gold. As a consequence, if the size of bank \( j \) is big enough vis-à-vis that of the credit market, each increase in the loan granted by this bank above the average amount of loan granted by competing banks gives rise to a debit of the former bank with the latter. Due to the organization of the monetary system under examination, the repayment of such a debt implies a compensatory gold transfer. This transfer determines a decrease in the gold reserves of bank \( j \). Therefore each bank, working in a credit market of imperfect competition and in a competitive deposit market, aims to adopt a credit policy in line with the policy of other banks, that is, banks aim to "act together"\(^{24}\).

Finally, constraint (22) points out that each bank has to avoid those lending behaviors which could extend in time or make it persistent an inflationary process. According to Schumpeter's model of "first approximation" (that is, the two-phase cycle), each entrepreneur realizes her expectations on output and profits. "Credit inflation" is thus a temporary phenomenon, and it is more than compensated by the downward adjustment of prices due to the the supply of the final goods produced by the innovative processes. If it was instead assumed that a part of the innovations does not realize the expected results or that innovations are an incentive to the adoption of speculative behaviors (such as in Schumpeter's four-phase cycle), the inflationary process could become persistent. This would lead to a conversion rate \((g)\) of bank deposits into gold equal to 1. For, in the presence of unexpected and non-negligible increases in prices (i.e., with \( q^* \geq q^* \)), the non-bank agents and the competing banks which come into possession of the 'claims' on money created by bank \( j \), would find it convenient to ask for the conversion into gold of all those 'claims' at the unchanging rate fixed in advance. Moreover the banks, even if they obtained the repayments agreed in each debt contract, would suffer the typical inflation 'tax' affecting creditors. Hence,

\(^{23}\) This simplification is arbitrary because it supposes that each individual bank, although enjoying a monopoly power in the credit market, cannot transfer this power to the deposit market. The models which examine the strategic interactions among banks in games à la Bertrand, have questioned also the consistency of such assumption (see Yannelle 1989). However, these models do not seem able to grasp the specificity of bank behaviors.

\(^{24}\) Schumpeter (cf. 1970, pp. 191-92) examines the benefits which the individual banks would obtain by "acting together". However Schumpeter states that, if the size of a given bank is prominent vis-à-vis the size of the credit market, such a bank can decide its credit policy in a (relatively) independent way from that of the competing banks. Schumpeter's statement is implicitly based on the assumption that this same bank can transfer its monopoly power from the credit market to the deposits market. In this paper, instead, I have assumed that the deposits market is of perfect competition (see above n. 23). It should be noted that Keynes too (1930) stresses the fact that individual banks should "act together" concerning their credit policy. However, Keynes does not seem to realize that it is the structure of the deposits market to make this constraint binding or non-binding.
in order to avoid the costs due to the reconstitution of its gold reserves or to its insolvency towards depositors and in order not to pay any inflation tax, each bank finds it convenient to screen its potential borrowers and to only finance those processes which are profitable at constant or lowering prices.

Constraint (19) tends to become binding when bank \( j \) finances borrowers belonging to higher-risk classes. Hence, each bank 'serves' first the potential borrowers belonging to the lowest risk classes. This implies that constraint (22) may be more binding when bank \( j \) finances higher-risk classes. My general conclusion is that the amount of loans supplied by an individual bank to each class of borrowers, which has a default risk lower than a given critical value, is an increasing function of the interest rate. On the other hand, the amount of loans supplied by an individual bank to those classes of borrowers which have a risk rate higher than a given critical value, can become null because any increase in the interest rate could be insufficient to compensate either such a risk or the illiquidity cost. These conclusions fit with Schumpeter’s analysis: the credit supply of individual banks is limited. However, this limit is elastic because it is based on banks’ expectations about the default risk of borrowers and the expected costs of illiquidity. This explains why such a limit does not justify the reference to a stable "bank multiplier" and why it heavily depends on the organization of the monetary system (see Schumpeter 1970, pp. 190-91; see also: Schumpeter 1996, ch.XIV).

These observations are sufficient to characterize the behavior of bank \( j \), which is formally specified by equations (18)-(22). As in the case of capitalists (see above, sec. 3), I do not solve the constrained maximization problem and, hence, I do not specify the analytical solution of bank \( j \)'s credit supply. I prefer to have recourse to a graphic solution, by reducing the \( \Omega \) risk classes to two (class 1 and class 2, where \( \sigma_1 < \sigma_2 \)), and by assuming that bank \( j \) will have a return equal to zero on the loans to borrowers in default (that is, \( X_k = 0 \)). These two simplifications imply that equation (18) and constraint (19) become - respectively:

\[
\max \pi_j = \max \left\{ \left[ (1 - \sigma_1) L_{S1} \left( (1 + r_{j1}) \right) + (1 + r_{j1})^2 \right] + (1 - \sigma_2) L_{S2} \left( (1 + r_{j2}) \right) + (1 + r_{j2})^2 \right\} - \left( 2L_j + iD_j + iB CB_j \right) 
\] (18bis)

\[
(1 - \sigma_1) \left[ \left( 1 + r_{j1} \right) + (1 + r_{j1})^2 \right] \geq 1 + \left( iD_j + iB CB_j \right) \frac{L_{S1}^j}{2L_j} 
\] (19a)

\[
(1 - \sigma_2) \left[ \left( 1 + r_{j2} \right) + (1 + r_{j2})^2 \right] \geq 1 + \left( iD_j + iB CB_j \right) \frac{L_{S2}^j}{2L_j} 
\] (19b)

\[
L_{S2}^j = 0 \quad \text{if} \quad 2L_j - L_{D1} \leq 0 
\] (21bis)
(18bis), (19a), (19b), (21bis), and (20) and (22) imply that the behavior of the entrepreneurs who are the potential borrowers of bank $j$ (that is the subset $v$, with $v \leq n$) and are included by the latter in the risk classes 1 and 2, can be depicted by means of two demand curves with a decreasing slope with respect to $r_j$. On the other hand, the two corresponding supply curves of bank $j$ have an increasing slope with respect to $r_j$ until critical values of these rate, and then they become infinitely rigid. These four curves lead to the following representation of the Schumpeterian equilibrium in the credit market (see Figures 3 and 4).

![Diagram](image-url)

Figure 3

$OA = C$ where $C = (iD_j + iCB) \frac{U_{i1}}{2L_j} \frac{1}{U_{i1}}$

$OB = L^*_1$

$OD = L^*_2$

$r_{m1} =$ minimum value of $r_j$

$r_{c1} =$ critical value of $r_j$
Price rationing for all the borrowers of class 2
OA = C
OB = L_1^*
L_m = minimum value of \( r_j \)
L_c = critical value of \( r_j \)

Quantity rationing for a subset of borrowers of class 1 (BF)
"Red lining" for the borrowers of class 2
OA = C
OB = L_1^*
BF = q. rationing
\( r_1^* \) = critical value of \( r_j \)
\( r_1^w \) = notional Walrasian rate of interest for class 1

Figure 4a

Figure 4b
Figure 3 shows that the working of the credit market does not lead to a single equilibrium interest rate but to a possible equilibrium interest rate for each of the risk classes (in my graphic representation, \( r_1^* \) and \( r_2^* \)). Moreover this Figure shows that, since bank \( j \) has a liquidity constraint (see above, constraint 22), the last part of its supply curve can be infinitely rigid. Finally it shows that bank \( j \) finances, first, entrepreneurs ranked in the class with the lowest risk and, then, entrepreneurs in the class with the highest risk but at an higher interest rate. This behavior of bank \( j \) implies that the \( L_{22}^j \) curve is not effective (notional) below \( r_{2m} \) where \( r_{2m} (\geq r_1^*) \) is the minimum level of the interest rate of the debt contract offered to borrowers ranked in class 2. As shown by Figure 4a, this feature of the riskiest supply curve of bank \( j \) can lead to a price rationing for all the borrowers of class 2, even if some of them would be ready to pay an interest rate higher than \( r_{2m} \). It is sufficient that \( L_{21} \) curve crosses \( L_{22}^j \) in its notional part. Moreover, as shown by Figure 4b, the possible rigidities of the last parts of bank \( j \)'s supply curves can imply a quantity rationing for a subset of the borrowers of class 1 and a null supply of means of payment ("red lining": see above) for the borrowers of class 2. It is sufficient that \( L_{21} \) curve crosses \( L_{s1}^j \) curve in its infinitely rigid part.

Assuming that each of the \( n \) entrepreneur addresses her demand for financing to all the \( m \) competing banks, it follows that each entrepreneur will find convenient to sign the debt contract which grants her the demanded amount of financing at the lowest interest rate. Hence the actual demand of entrepreneur \( i \) (\( i=1,2,...,n \)) is addressed to that bank who ranges her in the risk class with the lowest interest rate and who is ready to fully ‘serve’ her. This leads to an actual total demand for and to an actual total supply of credit for each of the risk classes, which determine corresponding equilibria interest rate. Moreover, a specific group of potential borrowers can have a positive excess demand for loans, and can thus suffer a sort of price or quantity credit rationing. The latter involves a sort of “red lining” for the groups of potential borrowers ranked in higher risk classes than that partially rationed by all the \( m \) banks.

These results also apply to a monetary system different from a “free gold standard” without interbank market. Let me continue to suppose that the credit supply of bank \( j \) has a binding liquidity constraint. If a well-organized interbank market is introduced or gold is replaced with legal tender, there will be – *ceteris paribus* – a loosening of constraint (22) and a consequent shifting on the right in the credit supply curve of bank \( j \) for each of the risk classes already financed as well as an increase in the critical value of the interest rate \( r_{2m} \) above which this supply can become null. In particular, an efficient interbank market implies that, in the case of a temporary illiquidity, each bank may resort not only to the limited re-financing power of the central bank, but also to a costly financing by competing banks. This last possibility decreases bank’s risk of illiquidity but does not eliminate the increasing shape of the illiquidity cost\(^{25} \). On the other hand, the substitution of legal tender for gold lowers, even

\(^{25}\text{Cf. Schumpeter 1970, pp. 155-59. It should be noted that, according to Schumpeter (bib, p. 177), borrowing from competing banks and even getting into debt with the central bank – in addition to the more usual cases – must be}\)
with a persistent "credit inflation", the expected conversion rate of bank's means of payment, and cancels the strict re-financement limits of the central bank (Schumpeter 1970, pp. 167-71; see also above, n. 20). However, the bank credit supply continues to have a limit, although more elastic than in the gold standard system without interbank market (e.g.: Schumpeter 1912, p. 163; Engl. trans., p. 114). It is sufficient to consider that the bank supply would remain bound by three factors: the increasing cost of central bank's re-financing, the increasing default risk of borrowers, and bank's convenience to avoid inflation 'tax'. In this perspective, there would be a limit in the credit supply of the individual bank even in a "pure credit" monetary system.

6. **Equilibrium, disequilibrium, and bank behavior**

Here I do not pursue further refinements of Schumpeter's analysis of the working of the credit market. It is more interesting to combine the results, reached in the two previous sections, with the role played by bank financing for the realization of the desired innovations in Schumpeter's development model (see also: Messori 2004). This combination shows that Schumpeter's analysis of the working of the credit market, once amended, could microfound the endogenous supply of money and strengthen its impact on the macroeconomic dynamics of the system. It follows that Schumpeter's analysis could take into account some of the most important issues faced by the recent monetary and financial theories.

Obviously this does not mean that Schumpeter's monetary theory, and consequently my Schumpeterian analysis of bank credit supply and demand, are free of analytical limits. Schumpeter himself (1917-18 and 1939) tries to undermine the foundations of his analysis by questioning the application of the demand and supply apparatus to the credit market. It is useful to assess Schumpeter's self-criticism since it allows the specification of several aspects of my Schumpeterian approach to bank behavior, and in particular my turning down an analytical representation of the credit market based on an out-of-equilibrium dynamics. Moreover, this assessment shows that the microeconomic behaviors of banks not only set price and/or quantity constraints which can hinder the realization of the desired innovations and imitations, but also perform a positive role of coordination for entrepreneurial activities. On the other hand, banks' role of coordination is suggested by the definition of banker as being the "ephor of the exchange economy" (Schumpeter 1912, p. 110; Engl. trans., p. 74) and by the definition of credit market as being "the headquarters of the capitalist system" where "the settlement of plans for further development is decided" (ibid., p. 205; Engl. trans., p. 126).

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26 Schumpeter (1970) and (1996) offer a number of suggestions bearing these implications. My positive appraisal of these two contributions contrasts with the way critics have received *Das Wesen des Geldes*. Apart from the works by Schneider (1970) and Graziani (1978) which greatly appreciate *Das Wesen des Geldes* (see also: Messori 1997), it must
Schumpeter's criticism to the application of the demand and supply apparatus to the credit market, refers to the (im)possibility of reaching an accurate determination of the two respective curves as well as to the interdependence among such curves.

As regards to the first aspect, Schumpeter (see 1939, pp. 602-6 and 608; see also: Messori 1987, sec. 3) states that the problems are due to the fact that the phases of the cyclical development are in disequilibrium. In an out-of-equilibrium process, the profit level expected from the realization of the innovative or imitative processes is subject to very frequent variations; furthermore, there are repeated changes in the number and in the 'scale' of these processes. These factors of instability determine too frequent shifts in the credit demand curve of the individual entrepreneurs and, a fortiori, in the corresponding aggregate demand curve. As noticed by Schumpeter, these shifts in the credit demand curves also encompass the credit supply curve of the individual bank since they change the points in which a given demand curve intersects the respective supply curve. Moreover, my refinement of Schumpeter's analysis on banks behavior implies that the instability in the expected profits and in the scale of innovative processes directly affects the functions of the default risk and of the related monetary proceeds in the various classes of borrowers and the same composition of each of these classes. This means that repeated shifts also occur along the and in the supply curves of financing of the different banks. Schumpeter's conclusion is that the application of the demand and supply apparatus to the credit market is of such a "doubtful value" that the working of this market has an "element of indeterminateness", and that the capability of the interest rate to ensure the equilibrium in this market is overestimated.

This conclusion seems to ask for an out-of-equilibrium dynamics, where different innovative processes begin and end up in every instant and where the credit and the goods markets work in continuous time. In this framework the labor and the goods markets would be always open, and it would be impossible to analytically prove that each innovative firm as well as the whole set of innovative firms have to pay the total amount of wages before monetizing their outputs. As a consequence, it would become impossible to specify the qualitative and quantitative side of the different debt contracts: in each instant, some firms could self-finance their innovative processes and others would have to apply for an indefinite amount of credit. Hence, from the analytical point of view, it would be lost one of the crucial aspects of Schumpeter's monetary analysis, that is that the availability of banks' credit is a binding constraint for the starting of each innovative process. I then prefer to follow the discrete time sequence which characterizes Schumpeter's processes of cyclical development.
and which allows to subdivide each phase of the Schumpeterian cycle into several periods, and each period into different instants.

If one refers to this time structure of Schumpeter's two-phase cycle, it will emerge at least three elements: (i) as already stated, entrepreneurs' demands for financing and the corresponding banks' supplies are set and realized at the opening instant of each period where an innovative or an imitative process occurs, (ii) at the opening instant of each of these periods, entrepreneurs' expectations about the future profits on their new activities to be financed, and banks' expectations about the default risks and the related monetary proceeds of their potential borrowers are given, and (iii) during the same or the following period, the market of final goods is cleared and the new productive activities achieve the expected outputs. Points (i)-(iii) show that Schumpeter's (1939) statement, concerning the disequilibrium in the cyclical processes, must be refined. In a discrete time sequence, each out-of-equilibrium process realizes a temporary equilibrium even if it does not meet the conditions for a sequential equilibrium (see Hicks 1965, chs. 2 and 3). This means that the decisions, undertaken by banks and entrepreneurs in the credit market at the opening instant of a given period, are affected by the conditions occurred in the different markets in the course of the previous period and by their expectations on the future events, but cannot be modified at all by the actual events occurring in the current period.

It follows that, differently from what has been stated by Schumpeter (1939), the instability of the supply and demand curves for financing does not jeopardize the application of the demand and supply apparatus to the credit market. In fact, the credit demand and supply curves tend to be instable from a period to another but to be well defined and stable at the opening instant of each period. Therefore, given my refinements of Schumpeter's analysis of bank behavior, the credit demand and supply curves ensure temporary equilibria in a Schumpeterian credit market which is part of an out-of-equilibrium multiperiod development process.

However, such a result does not seem to be robust to a second criticism which Schumpeter considers of great importance: the interdependence between the credit demand and supply curves. Schumpeter maintains the following argument (cf. 1912, p. 298; Engl. trans., p. 198; 1917-18, pp. 110-11; Engl. trans., p. 207): the credit demand and supply curves are useless analytical tools because, whenever a given bank meets entrepreneurs' demand for financing, the corresponding credit demand curve shifts upwards and, hence, begins an endless process of shifts along the supply curve and in the demand curve.

The rationale of Schumpeter's argument is quite simple. In his cyclical development model, entrepreneurs demand to banks that amount of means of payment which is required for withdrawing the units of the labor services (and of the here neglected land services) from the old productive units of the stationary state. Entrepreneurs need those units for starting their innovative or imitative processes. To simplify the matter, let me assume that the demand for
financing of the set of entrepreneurs is equal to the amount of money wages which, at the money wage rate in force at the stationary state, guarantees the purchasing of the labor units which are strictly necessary for the realization of the innovative processes. Given the full employment equilibrium in the labor market of the stationary state, and given the set of new activities be large enough to influence market prices, the new demand for labor units causes an increase in the equilibrium money wage. Besides eliminating a part of the demand for labor services made by the managers of the units already producing in the stationary state and still using the non-innovative methods, such an increase makes the demanded amount of credit insufficient for the realization of the innovative processes. In order to hire the still lacking labor units, entrepreneurs have to obtain an additional financial support by banks. However, if entrepreneurs' expectations continue to be static and 'myopic', banks supply of this additional financing will determine an unexpected further increase in money wages and, therefore, further increases in the demand for credit.

Schumpeter's (1917-18) conclusion is that any increase in the credit granted causes a further increase in the amount of financing which is needed for purchasing a given amount of labor services and, therefore, a further increase in the demand for credit. This conclusion suggests that the interdependence between the supply and demand curves for credit primes a run which can be stopped only through a quantity credit rationing by the different banks. Credit rationing prevents entrepreneurs from realizing all their desired innovations and, in the case just examined, can even hinder the starting of the cyclical development. In any case, even before binding quantitative constraints occur, the credit market becomes unstable and transmits its instability to the labor market.

Therefore, the interdependence between the supply and demand curves for financing seems to provide a robust foundation to Schumpeter's criticism with respect to the utilization of the demand and supply apparatus for the analysis of the credit market. The problem is that Schumpeter (1917-18 and 1939) does not prove his statement. From a formal point of view, this statement amounts to stating that the progression of the increases in the demand for financing or the corresponding progression of the increases in the money wages do not asymptotically approach zero, or else that the series of the amount of credit demanded and the corresponding series of the level of money wages do not asymptotically approach given

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27 This assumption is heroic since it implies that (a) the new processes have a given minimum technical size, and that (b) the entrepreneurs act on the basis of static and 'myopic' expectations, rather than on the basis of rational or – at least – adaptive expectations. However, compared to the problem analyzed here, these are not restrictive assumptions because they strengthen Schumpeter's argument which I aim to criticize. The same applies to the other simplifying assumptions which will be introduced in the course of my reasoning.

28 Although Schumpeter refers to the traditional labor supply curve, which – at least in the first part – is increasing with the real wage (e.g.: 1912, pp. 27-8; Engl. trans., pp. 22-3), Schumpeter's analysis requires that the labor supply becomes infinitely rigid at the predetermined level of full employment. For a brief discussion of the ad hoc assumptions which must be introduced to make Schumpeter's analysis coherent, see: Messori 1987, p. 147, nn. 12 and 13.

29 It should be noted that Schumpeter does not explicitly discuss the possibility of credit rationing and, therefore, provides neither a precise definition, nor an analytical foundation of this phenomenon.
values. However, it can be easily proved that such implications are not correct. Even if a set of heroic conditions which are the most favorable to Schumpeter's thesis (myopia in entrepreneurial expectations, minimum technical scale of the innovative activity, lack of price and quantity rationing) is assumed, a formal analysis of the first two progressions will prove their convergence towards zero and a formal analysis of the last two series will prove their convergence towards given values\(^{30}\).

These results show that the interdependence between the supply and demand curves for credit is bound to well defined limits. As a consequence, such interdependence can make the efficient design of the debt contract between the individual bank and its borrowers with an equal function of the expected profit and default risk, more complex\(^ {31}\). However, such interdependence cannot justify the rejection of the demand and supply apparatus as a useful tool for analyzing the working of the credit market in temporary equilibrium. Hence my previous analysis of the working of the Schumpeterian credit market, which represents a refinement of Schumpeter's framework, shows to be robust even with respect to the criticism raised by Schumpeter himself.

7. Conclusions: banks as social accountants

This conclusion contrasts with various passages by Schumpeter (1917-18 and 1939) but not with the remarks made in Schumpeter (1970). In this last work, Schumpeter underlines that his criticism of the demand and supply apparatus concerns its application "to the problems of money value" and not its application to the behavior of banks and borrowers (cf. 1970, pp. 306-13; see also: ibid, p. 233). Schumpeter (1970), by examining in detail the supply and demand for financing, goes indeed so far as to hint that the individual bank finds it convenient to determine various supply curves as a screening device of its potential borrowers; and, although at an empirical more than at a theoretical stage, he seems to be also ready to abandon the reference to a unique equilibrium interest rate.

However the essential contribution, offered by Schumpeter (1970) as regards to the way the credit market works, does not concern the analysis of the supply and demand curves for financing but the analysis of the role of coordination played by the credit market for the entrepreneurial activities in the course of the cyclical development. As recalled above, this role of coordination is suggested both in Schumpeter (1912, pp. 110 and 205, Engl. trans., pp.

\(^{30}\) In this paper it is not useful to investigate such problem in a detailed way. For a more precise analysis, let me refer to: Messori 1987, secs. 4 and 5.

\(^{31}\) By referring to recent contributions concerning the debt contracts design between an individual bank and its borrowers, it would be possible to re-interpret the Schumpeterian approach by means of a "three-stage game". In the first stage the bank offers various debt contracts, in the second stage each borrower chooses the preferred contract amongst those offered to her, and in the third stage the bank decides which contracts to carry out given borrowers' choices. The interdependence among the supply and demand curves for credit complicates this three-stage game. At the end of the third stage, the borrowers who have been served may ask the bank to reiterate the game by starting again from the first stage. At the same time, the bank may confirm or modify its supply of debt contracts.
74 and 126) and in Schumpeter (1939, p. 641), but it is deeply investigated only in Schumpeter (1970). In the latter this same role of credit market finds an ideal foundation in the representation of the economic system as a set of relations amongst the monetary budgets of the individual agents. In this respect Schumpeter states that, in a capitalist economy, all the economic subjects "have to settle the accounts amongst themselves and have to verify the accounts of their individual productive processes" so that the individual behaviors are subject to the constraint of the individual budgets and are made compatible within "an economic book-keeping of the society". Schumpeter adds that the regulation and the verification of such accounts are managed by banks through the accounting entries which refer to the lending and to the exchanges amongst agents and through the reckoning of the consequent interbank relations on the relative market or through the central bank, so that the "current account balances" become the "fundamental concept of the monetary doctrine".

Therefore, the banking system is urged to manage the essential components of the system of payments and to act as the center of the social accounts. This function of social accountant, which stresses the "essence of money as a social institution" needed for guaranteeing the constrained realization of individual choices and for rendering these choices mutually compatible, has a crucial impact on the working of the economy. It implies that each bank, by creating means of payment in favor of entrepreneurs and by controlling the budget constraint of its depositors, regulates the access that non-bank agents have to the different markets and, to a certain extent, attests their economic credibility. Schumpeter's considerations become particularly important if the case of bank loans to the entrepreneurs is applied to the current models with imperfect information. In order to achieve an efficient allocation of its flows of financing and in order to provide the best entrepreneurs with adequate incentives, each individual bank must collect, centralize and utilize information for the design of optimal debt contracts to be offered to its potential borrowers with a default risk lower than a given critical value, and for the quantity rationing of the remaining potential borrowers. In this way, the allocation and the supply conditions of the financing made available by each bank spread the information about the reliability of the different entrepreneurs to the whole set of non-bank agents.

This re-interpretation of banks as social accountants strengthens the meaning of some passages by Schumpeter himself (1912 and 1939) concerning bank behavior and quoted above. For example: the function of social book-keeping, fulfilled by banks, clarifies why Schumpeter (1912) stresses that bank credit represents a "voucher" which is issued in the

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32 Schumpeter 1970, pp. 125-27. It is interesting to note that this analysis induces Schumpeter to set up a parallel between the "central agency of a socialist community" and the banking system. In the pages just quoted, Schumpeter states that "even the market economy is a planned economy", and that the plan is coordinated by that "central accounting department of the society" which is the banking system. This implies that the function fulfilled by the means of payment as units of account is essential in the socialist as well as in the capitalist economy. As suggested by Hicks (e.g.: 1956; see also: Messori-Tamborini 1995), the reference to the budgets of the individual agents and to the social book-keeping allows also to analyze the credit flows and the money stocks within a unique monetary theory.
name of the society and which allows entrepreneurs to buy before having sold. The reference to such a function also clarifies why the Schumpeterian banks have to perform not only a screening activity about their own borrowers, but also a positive or negative incentive activity with respect to their preferred customers. Such an incentive activity occurs nearly automatically: bank financing of a given innovative process acts as a positive signal as regard to its expected profitability and, hence, it stimulates secondary innovations or imitative processes.

Schumpeter's hints (1970) are relevant for credit theory since they highlight the macroeconomic importance of the role of social accountants carried out by individual banks. Unfortunately these hints have been neglected in the history of economic analysis and have only re-emerged in the recent literature. The merit of such rediscovery can be attributed to Stiglitz and Weiss (1988) who refer to the bank function of social accountant in order to explain the establishment of customer relationships between banks and firms in an economic process with information asymmetries. In Stiglitz-Weiss' model such a function has an essential role to play because it can mitigate the negative effects which the information asymmetries exercise on the efficiency of the economic system. Unlike the information spread by non-bank agents, the granting of loans represents a credible signal for at least two reasons: by having economic relations with a wide but limited range of borrowers, each bank is in the optimal position for assessing the absolute and relative degree of reliability of each of its borrowers; by drawing up debt contracts with the screened entrepreneurs, each bank takes upon itself the risk of its assessment.

Stiglitz-Weiss' (1988) considerations start to highlight the modernity of Schumpeter's analysis in attributing to the banks the function of social accountants. However, these considerations are not sufficient for stressing the potentialities of such a function with respect to the recent models on credit market, characterized by the assumption of information asymmetries between the "principal" (an individual bank) and the "agents" (its borrowers). In Schumpeter's framework (1912, 1939, and 1970), there is no reference to the concept of information asymmetries; however Schumpeter (1970) perceives that, by carrying out the function of social accountant, any individual bank can acquire information advantages, compared to its competing banks, with respect to given subsets of borrowers and, therefore, with respect to specific segments of the credit market. Schumpeter (1970, pp. 153-54) states that each bank can control and manage a "piece of the social book-keeping"; and this management involves the acquisition and the centralization of information as regards to the subjects involved. Therefore, each individual bank has a greater information than the competing banks about the borrowers who belong to its "piece" of the social book-keeping.

33 Stiglitz-Weiss (1988) recognize, through a long quotation in a footnote, their debt with respect to Schumpeter (1970). It should be remembered that there is information asymmetry when the subjects (buyers or sellers), operating on a side of a given market, have more information about some variables which are important for the exchange, than the subjects (sellers or buyers), operating on the other side of the same market.
My conclusion is that the reexamination of Schumpeter's monetary theory leads to at least two interesting results: (i) this theory, elaborated in the major works of Schumpeter (see 1912, 1939, 1954) as well as in Schumpeter (1917-18), is further developed in Schumpeter (1970 and 1996); (ii) such developments largely contribute to point out its importance not only for the twentieth century history of the monetary analysis but also for the recent debate in monetary theory. Concerning point (i), as just said the Theory of money and banking opens the possibility of replacing the interest rate with a vector of interest rates and restrains Schumpeter's criticism (1917-18 and 1939) of the supply and demand curves for credit to the problem of the value of money. Concerning point (ii), this same book helps the microfoundation of the bank behaviors and offers a first explanation to the information distribution amongst banks.

Point (i) implies that Schumpeter's analysis of the working of the credit market represents the peak of that stream in the history of monetary analysis which is opened by Marx in the second and third book of Capital and is continued by authors such as Wicksell (1898), A. Hahn (1920), Robertson (1926) and Keynes (1930). In particular, compared to Wicksell (1898) pure credit system, Schumpeter's approach underlines that the individual bank does not behave on the basis of a unique and infinitely elastic supply of means of payment but rather on the basis of a set of supplies which are an increasing function of interest rates and which become infinitely rigid besides given amounts of financing. Compared to Keynes (1930), Schumpeter's approach stresses that the links between the credit and the deposits markets are crucial to analyze the constraints which the competing banks place on the lending activity of each individual bank.

In terms of the recent analyses of the credit market, point (ii) implies the introduction of a different type of information asymmetries: the asymmetries among competing banks. Sharpe (1990) refers to this type of asymmetries when he underlines that the establishment of long-term "customer relationships" between individual banks and specific groups of borrowers can imply that the latter are "informationally captured" by the former. However, as in the case of information asymmetries which have been examined by various models on credit rationing (see Stiglitz-Weiss 1981, 1992; Milde-Riley 1988), Sharpe’s model is centered on the relationships between the individual bank and its different borrowers. Hence, when firms are "informationally captured" by a given bank, the impact of the information asymmetry between this bank and its borrowers decreases. Vice versa, concerning the relationships among different banks, the information asymmetries implicitly perceived by Schumpeter are complementary to those between a given bank and its borrowers. The function of social accountant, carried out by a bank in favor of its borrowers, ensures an information advantage to this bank compared to the competing banks but it does not eliminate its lack of information concerning its borrowers.
Such a result is important for various reasons. For example, still better than in Sharpe's model (1990), the Schumpeterian framework allows to examine the form and degree of segmentation of the credit market by resorting to the new tools offered by the information distribution. However, the most important implication is that, by making the information asymmetries between banks and between an individual bank and its borrowers complementary, the analysis of debt contracts is greatly enriched. In the parlance of contract theory, the relationship between the single "principal" and a multiplicity of agents can be transformed into a relationship between a multiplicity of 'principals' and a multiplicity of agents\(^34\). Hence the suggestions, offered by Schumpeter's monetary theory, are important not only from the history of economic analysis point of view but also as regards to the problems unsolved in the modern monetary theory.

\[\text{Bibliography}\]


\(^{34}\) The possibility is very important from the analytical point of view. It could "open the doors" to the utilization of the contract theory not only in the case of 'small numbers' but also in the case of relationships which affect the working of the economic system.


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